HURRICANE ALICIA—PREDICTION, DAMAGE, AND RECOVERY EFFORTS

HEARINGS

[INCLUDING SUMMARY]

BEFORE THE

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY

AND THE

SUBCOMMITTEE ON WATER RESOURCES

OF THE

COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION

U.S. HOUSE OF REPRESENTATIVES

NINETY-EIGHTH CONGRESS

FIRST SESSION

SEPTEMBER 23, 1983—Committee on Science and Technology
SEPTEMBER 24, 1983—Committee on Public Works and Transportation

---

[No. 81]

(Committee on Science and Technology)

(98-26)

(Committee on Public Works and Transportation)

Printed for the use of the Committee on Science and Technology and the Committee on Public Works and Transportation

---

U.S. GOVERNMENT PRINTING OFFICE
33-446 O WASHINGTON : 1984

H641-19
H701-55

COMMITTEE ON SCIENCE AND TECHNOLOGY

DON FUQUA, Florida, *Chairman*

ROBERT A. ROE, New Jersey
GEORGE E. BROWN, Jr., California
JAMES H. SCHEUER, New York
RICHARD L. OTTINGER, New York
TOM HARKIN, Iowa
MARILYN LLOYD, Tennessee
DOUG WALGREN, Pennsylvania
DAN GLICKMAN, Kansas
ALBERT GORE, Jr., Tennessee
ROBERT A. YOUNG, Missouri
HAROLD L. VOLKMER, Missouri
BILL NELSON, Florida
STAN LUNDINE, New York
RALPH M. HALL, Texas
DAVE McCURDY, Oklahoma
MERVYN M. DYMALLY, California
PAUL SIMON, Illinois
NORMAN Y. MINETA, California
RICHARD J. DURBIN, Illinois
MICHAEL A. ANDREWS, Texas
BUDDY MacKAY, Florida
TIM VALENTINE, North Carolina
HARRY M. REID, Nevada
ROBERT G. TORRICELLI, New Jersey
FREDERICK C. BOUCHER, Virginia

LARRY WINN, Jr., Kansas
MANUEL LUJAN, Jr., New Mexico
ROBERT S. WALKER, Pennsylvania
WILLIAM CARNEY, New York
F. JAMES SENSENBRENNER, Jr., Wisconsin
JUDD GREGG, New Hampshire
RAYMOND J. McGRATH, New York
JOE SKEEN, New Mexico
CLAUDINE SCHNEIDER, Rhode Island
BILL LOWERY, California
ROD CHANDLER, Washington
HERBERT H. BATEMAN, Virginia
SHERWOOD L. BOEHLERT, New York
ALFRED A. (AL) McCANDLESS, California
TOM LEWIS, Florida

J. H. Poore, *Executive Director*
Robert C. Ketcham, *General Counsel*
Regina A. Davis, *Administrator*
David S. Jeffery, *Minority Staff Director*

Subcommittee on Natural Resources, Agriculture Research and Environment

JAMES H. SCHEUER, New York, *Chairman*

TIM VALENTINE, North Carolina
TOM HARKIN, Iowa
MICHAEL A. ANDREWS, Texas
BUDDY MacKAY, Florida
ROBERT G. TORRICELLI, New Jersey
GEORGE E. BROWN, Jr., California

RAYMOND J. McGRATH, New York
CLAUDINE SCHNEIDER, Rhode Island
ROD CHANDLER, Washington
TOM LEWIS, Florida

COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION

JAMES J. HOWARD, New Jersey, *Chairman*

GLENN M. ANDERSON, California
ROBERT A. ROE, New Jersey
JOHN B. BREAUX, Louisiana
NORMAN Y. MINETA, California
ELLIOTT H. LEVITAS, Georgia
JAMES L. OBERSTAR, Minnesota
HENRY J. NOWAK, New York
ROBERT W. EDGAR, Pennsylvania
ROBERT A. YOUNG, Missouri
NICK JOE RAHALL II, West Virginia
DOUGLAS APPLEGATE, Ohio
GERALDINE A. FERRARO, New York
BRIAN J. DONNELLY, Massachusetts
DONALD JOSEPH ALBOSTA, Michigan
RON DE LUGO, Virgin Islands
GUS SAVAGE, Illinois
FOFO I. F. SUNIA, American Samoa
KATIE HALL, Indiana
DOUGLAS H. BOSCO, California
JAMES F. McNULTY, JR., Arizona
JIM MOODY, Wisconsin
ROBERT A. BORSKI, Pennsylvania
JOE KOLTER, Pennsylvania
TIM VALENTINE, North Carolina
EDOLPHUS TOWNS, New York
WILLIAM O. LIPINSKI, Illinois
MICHAEL A. ANDREWS, Texas
TOM VANDERGRIFF, Texas
J. ROY ROWLAND, Georgia
JAMES McCLURE CLARKE, North Carolina
ROBERT E. WISE, JR., West Virginia

GENE SNYDER, Kentucky
JOHN PAUL HAMMERSCHMIDT, Arkansas
BUD SHUSTER, Pennsylvania
ARLAN STANGELAND, Minnesota
NEWT GINGRICH, Georgia
WILLIAM F. CLINGER, JR., Pennsylvania
GUY MOLINARI, New York
E. CLAY SHAW, JR., Florida
BOB McEWEN, Ohio
FRANK WOLF, Virginia
THOMAS E. PETRI, Wisconsin
HAL DAUB, Nebraska
LYNN MARTIN, Illinois
VIN WEBER, Minnesota
ROBERT F. (BOB) SMITH, Oregon
DON SUNDQUIST, Tennessee
NANCY L. JOHNSON, Connecticut
RON PACKARD, California

SUBCOMMITTEE ON WATER RESOURCES

ROBERT A. ROE, New Jersey, *Chairman*

JOHN B. BREAUX, Louisiana
DONALD JOSEPH ALBOSTA, Michigan
RON DE LUGO, Virgin Islands
J. ROY ROWLAND, Georgia
GLENN M. ANDERSON, California
JAMES L. OBERSTAR, Minnesota
HENRY J. NOWAK, New York
ROBERT W. EDGAR, Pennsylvania
ROBERT A. YOUNG, Missouri
NICK JOE RAHALL II, West Virginia
GERALDINE A. FERRARO, New York
BRIAN J. DONNELLY, Massachusetts
GUS SAVAGE, Illinois
FOFO I. F. SUNIA, America Samoa
JAMES F. McNULTY, JR., Arizona
JIM MOODY, Wisconsin
JAMES J. HOWARD, New Jersey
(Ex Officio)

ARLAN STANGELAND, Minnesota
JOHN PAUL HAMMERSCHMIDT, Arkansas
GUY MOLINARI, New York
BOB McEWEN, Ohio
HAL DAUB, Nebraska
VIN WEBER, Minnesota
ROBERT F. (BOB) SMITH, Oregon
RON PACKARD, California
GENE SNYDER, Kentucky
(Ex Officio)

CONTENTS

Page

Letter from Congressman Michael A. Andrews to Congressmen James J. Howard, Don Fuqua, Robert A. Roe, and James H. Scheuer VII

Summary of hearings on Hurricane Alicia, by Dr. Robert E. Morrison, Dr. Clark F. Norton, and Malcolm M. Simmons, Congressional Research Service of the Library of Congress XIII

WITNESSES

SEPTEMBER 23, 1983—COMMITTEE ON SCIENCE AND TECHNOLOGY

Neil L. Frank, Ph.D., Director, National Hurricane Center, National Weather Service; Steven Harned, meteorologist in charge, Houston area Weather Service Office 3

Ed Brandon, director of weather services, weather reporter KTRK-TV Eyewitness News, Houston, Tex.; and Tom Silver, KHOU-TV 37

Hon. E. Gus Manuel, mayor, city of Galveston, Tex 49

Billie Fife, coordinator, emergency preparedness, Pasadena, Tex.; J. Fletcher Hickerson, civil defense director, city of Baytown, Tex 58

SEPTEMBER 24, 1983—COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION

Beall, Ray M., director of disaster services, Greater Houston Area chapter, American Red Cross 119
  Prepared statement 115

Cannon, Hon. Allen, mayor, city of Baytown, Tex 85
  Prepared statement 83

Darby, George L., Area Director, Disaster Area 3, U.S. Small Business Administration 156
  Prepared statement 129

Garland, J. R., Chairman, Channel Industries Mutual Aid, and Chairman, Atlantic Richfield 119
  Prepared statement 114

Greenwade, Jack D., Houston Lighting and Power Co 119
  Prepared statement 112

Huffman, Stephen N., city manager, city of Galveston, Tex 85
  Prepared statement 78

Lansford, Robert A., state coordinator, Governor's division of emergency management, Texas Department of Public Safety 156
  Prepared statement 131

Laubscher, Col. Alan L., District Engineer, Galveston District, U.S. Army Corps of Engineers 156
  Prepared statement 154

Lindsey, Hon. Jon, county judge, Harris County, Tex., represented by Perry Simmons, administrative assistant 85
  Prepared statement 81

Petree, Hon. Harvey, mayor pro-tem, city of Deer Park, Tex 85
  Prepared statement 83

Vessey, Robert D., director of disaster services, American Red Cross, Houston chapter 119
  Prepared statement 116

Wetzel, Hon. Wilbur O., Jr., mayor pro-tem, city of Kemah, Tex 85
  Prepared statement 85

Whitmire, Hon. Kathryn J., mayor, city of Houston, Tex 85
  Prepared statement 76

Page
Whittington, Dick, Regional Administrator, U.S. Environmental Protection Agency, region VI 156
  Prepared statement 152
Winkle, Joseph, Assistant Associate Director for Disaster Programs, Federal Emergency Management Agency; accompanied by Robert Broussard, Federal Coordinating Officer, Hurricane Alicia; and Donald Collins, Assistant Administrator for Federal Insurance Administration 156
  Prepared statement 127

ADDITIONS TO THE RECORD

Gumnick, James L., Ph.D., president, GURC, statement: "GURC Response to a Need for Integrated Emergency Preparedness Planning in the Houston/Galveston Area" 177
The Alicia Story (How Houston Lighting & Power Co. Responded to Hurricane Alicia) August 1983 179
Map of Houston-Galveston area 137

MICHAEL A. ANDREWS
25TH DISTRICT, TEXAS

1022 LONGWORTH HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515
(202) 225-7508

COMMITTEES:

PUBLIC WORKS AND
TRANSPORTATION

SCIENCE AND TECHNOLOGY

DISTRICT OFFICES:

HOUSTON OFFICE:
7707 FANNIN
HOUSTON, TEXAS 77054
(713) 791-1877

EAST HARRIS COUNTY OFFICE:
4008 VISTA
PASADENA, TEXAS 77504
(713) 943-6933

Congress of the United States
House of Representatives
Washington, D.C. 20515

June 28, 1984

The Honorable James J. Howard Chairman, Committee on Public Works and Transportation	The Honorable Don Fuqua Chairman, Committee on Science and Technology
The Honorable Robert A. Roe Chairman, Subcommittee on Water Resources	The Honorable James H. Scheuer Chairman, Subcommittee on Natural Resources, Agriculture Research and Environment

Gentlemen:

Hurricane Alicia was a personal disaster for thousands living on the Texas coast. Eleven people were killed and property damage was estimated to be $1.7 billion. Few of my constituents were untouched by the worst storm in Houston for 40 years. During field hearings held in September 1983 in Houston on the effects of Alicia, I learned a great deal about the hurricane phenomenon; federal, state and municipal response programs; and the special problems any community faces in the event of a full scale storm. Alicia was rated a force three storm at its worst hour. A storm, in 1900 that resulted in the deaths of 6,000 in Galveston was a weak five. Since last fall I have been told repeatedly by hurricane experts that in time the Texas coast will again be hit by a force five hurricane. Recent legislative efforts have been devoted to improving our community's ability to deal with future storms with improved safety.

On September 23 and 24 1983, two subcommittees, one from the House Science and Technology Committee and one from the House Public Works and Transportation Committee came to Houston to survey the damage and address the issues raised by Alicia. The September 23 hearing held by the Science and Technology Subcommittee on Natural Resources, Agricultural Research and the Environment focused on the effectiveness of National Weather Service operations during Alicia and issues associated with hurricane prediction and emergency preparedness. On September 24, the Subcommittee on Water Resources of the House Committee on Public Works and Transportation considered the federal, state and local responses to Alicia.

I came away from the September 23 session with some important discoveries: One, there is no substitute for a well-coordinated local emergency preparedness network. Such a network is well-established in the Galveston area and served the citizens of that city well during Alicia. Two, the closing of weather service stations in the Galveston and Houston areas would undermine that local network and increase danger to the public during an emergency weather situation. Three, better coordination and communication is needed between the local officials in each of the many jurisdictions in the Galveston-Houston area. Four, a fully integrated emergency management plan understood by the officials of each jurisdiction is needed. Five, severe weather warnings should be issued by one voice, preferably that of the National Weather Service. Our September 23 testimony revealed an excellent working relationship between the local NWS office and local officials. Citizens should not be put in the position of having to choose between the advice of different experts when their very lives may be in danger.

Among other things, Title II of the Disaster Relief Act of 1974 authorizes the President to establish a disaster preparedness program utilizing all federal comprehensive state emergency plans with annual matching grants of up to $25,000. The State of Texas has been working with Federal Emergency Management Administration (FEMA) Title II funding for several years to develop computer models projecting the depth of flooding and water surges at various elevations during severe storms. These models, called S.L.O.S.H. studies (Sea-Lake Overland Surge of Hurricanes), have been made available to localities in our area. Mr. Hickerson, the Civil Defense Director of Baytown, testified that the S.L.O.S.H. study for his community proved invaluable in their development of an evacuation plan.

The S.L.O.S.H. studies are the first of a three step planning process. The second is the completion of a vulnerability analysis under which the State determines what areas would be vulnerable in various storm situations. The final step, the contingency plan, is the crux of the State's emergency preparedness effort. It is at this point that the State determines how best to minimize loss of life and property, including evacuation strategies. Work on the contingency plan for our area began in late 1983. I cannot overemphasize my support for the timely completion and implementation of this program by the State and the need for thorough and regular briefing of local officials. Ultimately, the key to saving lives and property will be coordination and communication between jurisdictions. Every mayor from Galveston to Houston can be armed with contingency plans when a force five hurricane threatens, but if they do not communicate with each other--it may not matter. Coordination must originate on the state and local level. I was pleased to learn of the effort by the Gulf Universities Research Council(GURC) to design an exercise based on simulated hurricane responses by local officials. GURC is pursuing local support from the private sector for both financial aid and services-in-kind to accomplish the goals of this program. I whole-heartedly urge this local interest and involvement.

On September 24, 1983 the Subcommittee on Water Resources of the House Committee on Public Works and Transportation met to consider the federal, state and local responses to Hurricane Alicia. We heard from 15 witnesses ranging from the Governor's office and the Red Cross to the Federal Emergency Management Administration (FEMA), the Small Business Administration (SBA), and the Army Corps of Engineers. FEMA reported that more than a thousand damage reports had been completed and that local governments would receive a total of $32 million in FEMA aid. The SBA interviewed over 16,000 victims who sought emergency loans, while the Federal Insurance Administration closed over 1,318 flood insurance cases. Local officials expressed satisfaction and appreciation for the response by federal agencies in the wake of Alicia. However, there were some significant exceptions.

The smaller communities in my area were at a disadvantage in responding to Alicia. Houston and Galveston have the personnel, the heavy equipment and the money to address the immediate needs of their citizens following such a storm. Smaller communities, however, were paralyzed and made vulnerable by their lack of resources. Without the benefit of early advice from the Federal Government, smaller cities were in the dark about their own eligibility for federal assistance. With their tax bases significantly eroded (Kemah lost all but four of its 30 businesses), many smaller cities could not act on their own behalf before FEMA arrived on the scene almost a week later. Debris clearance is essential in the hours immediately following a hurricane's passage. Police, fire and other emergency vehicles must be able to move and communications and electric power must be restored as soon as possible. Mayor Whitmire of Houston reported a great deal of confusion on the part of her administration concerning FEMA specifications for debris clearance contracts bids. Also, there was some uncertainty by FEMA about where disaster service centers should be located to do the most good.

Under current law, FEMA action can only be triggered by a Presidential declaration even though prior to the 1974 amendments the 1970 Disaster Relief Act authorized the President "to use federal departments, agencies, and instrumentalities... to avert or lessen the effects of such disaster before its actual occurrence." This language needs to be restored and strengthened to require FEMA to dispatch teams to endangered areas when a major disaster appears imminent. Thus FEMA could "get the lay of the land," quickly determine the best locations for service centers, and meet with local officials to coordinate and facilitate the distribution of aid.

While the 1974 Disaster Relief Act provides for 100 percent reimbursement for debris clearance and for the repair and restoration of public facilities damaged in a major disaster, it has been this Administration's policy, since the volcanic eruption of Mount St. Helens in May 1980, to reduce payments for both purposes to 75 percent. This policy is completely unrealistic for small communities. Again, consider Kemah, a town that lost all but four of its 30 businesses. If it were required to pay 25% of the cost of clean up and reconstruction, the city would have been bankrupted. Cities like Kemah and Shore Acreas, for example, should be required to contribute at most 5-10 percent of the cost, if anything at all.

Finally, an issue of great concern involves flooding along possible evacuation routes. There are only three ways to get off Galveston Island in the event of a hurricane. Two of these routes, the ferry and the bridge are rendered impassable by four foot tides. The final escape route is I-45 along which there are several points vulnerable to early flooding.

To respond to the evacuation problem I authored an amendment to the Highway and Transit Authorization Bill which authorizes a flooding and safety study of I-45. The amendment directs the Secretary of Transportation in cooperation with the State of Texas to conduct a study of ways to prevent flooding, improve safety and analyze characteristics of this route during severe weather.

Also, one of the major evacuation routes for the Baytown and East Harris County communities, I-10, was almost blocked because two unanchored barges were driven against the bridge over the San Jacinto River. There is a real need to develop a hurricane contingency plan for the San Jancinto River near I-10. I have been advised that the Houston Port Safety and Advisory Council has formed a special industry committee to develop a recommended course of action in the event of a weather disaster in the future.

I am enclosing the complete testimony from our hearings, a summary of the hearings completed by the Congressional Research Service, the Corps of Engineers' report and Houston Lighting and Power's The Alicia Story. These materials present a good overview of Alicia and the issues it has raised.

It is my hope that this report will assist federal, state and local officials to identify the issues that must be addressed during threatened weather emergencies. This document contains valuable information which, if put into practice, will minimize the potentially disastrous effects of future hurricanes which hit the Houston-Galveston coast.

In closing, I want to thank you for the enthusiastic and unwavering support you gave me as I investigated the issues raised by hurricane emergencies. Special gratitude also goes to those individuals who gave generously of their time and energy to make these hearings successful.

Very truly yours,

Michael A. Andrews

Michael A. Andrews
Member of Congress

MAA:rjd
enclosure

Congressional Research Service
The Library of Congress

Washington, D.C. 20540

SUMMARY OF HEARINGS ON HURRICANE ALICIA

Robert E. Morrison
Specialist in Marine Science
Science Policy Research Division

Clark F. Norton
Specialist in American National Government
Government Division

and

Malcolm M. Simmons
Analyst
Environment and Natural Resources Policy Division

March 5, 1984

CONTENTS

I. INTRODUCTION.. 1

II. HURRICANE PREDICTION AND FUNCTIONS OF THE NATIONAL WEATHER SERVICE.. 3
- A. Background.. 3
  - 1. Hurricane Prediction.. 3
  - 2. The National Weather Service and Its Functions............... 4
  - 3. Hurricane Alicia.. 7
  - 4. Proposed Changes to the National Weather Service............ 8
- B. Summary of Testimony on Hurricane Prediction and National Weather Service Activities............................ 13
  - 1. Effectiveness of the National Weather Service in Forecasting Hurricane Alicia............................... 13
  - 2. Effectiveness of the National Weather Service Hurricane Rating Systems................................. 16
  - 3. Sources of Weather Information and How Information is Used by Local Officials................................ 19
  - 4. Problems Which Could Arise in Translation of Storm Predictions from the Primary Sources to the Media for Widespread Distribution................................... 22
  - 5. The Role of the Private Sector in the Issuing of Severe Weather Warnings.................................. 24
  - 6. Possible Impairment of National Weather Service Functions Which Could Result from Proposed Reductions in Weather Service Offices and Personnel.................... 26

III. DAMAGE AND RECOVERY EFFORTS ASSOCIATED WITH HURRICANE ALICIA......... 30
- A. Background.. 30
  - 1. Historical Perspective on Earlier Disaster Relief Provisions..................................... 30
  - 2. Disaster Relief Legislation Since 1950...................... 31
  - 3. The Role of the Army Corps of Engineers in Disaster Assistance and Prevention............................... 36
  - 4. The National Flood Insurance Program........................ 38
  - 5. The Role of the Small Business Administration in Disaster Assistance... 40
  - 6. Pending Disaster Relief Legislation......................... 43
- B. Summary of Testimony on Damage and Recovery Efforts Following Alicia.. 44
  - 1. Preparedness, Communications and Evacuation: Effectiveness and Needs...................................... 44
  - 2. Response of FEMA and Other Federal Agencies to Hurricane Alicia.. 46
  - 3. Adequacy of Emergency Aid Funds for Local Communities........ 50
  - 4. Debris Clearance Problems and Contracts..................... 51

5. Corps of Engineers Projects and Contingency Activities Related to Alicia.................................. 51
6. Potential Problems from Barges at the Bridge................. 55
7. The National Flood Insurance Program and Hurricane Alicia.. 55
8. The Small Business Administration and Hurricane Alicia.. 57
9. Proposed Changes in Disaster Relief Legislation and Regulations.. 59

I. INTRODUCTION

In August 1983, Hurricane Alicia, the first hurricane to strike the U.S. mainland since 1980, crossed the coastline at Galveston and struck Houston and other east Texas areas, causing extensive property damage and some loss of life. In the aftermath of this weather disaster, hearings were conducted in Houston, on September 23 and 24, 1983, by two subcommittees of the U.S. House of Representatives.

The hearing by the Subcommittee on Natural Resources, Agriculture Research and Environment of the Committee on Science and Technology, held September 23, was intended to examine primarily issues related to severe weather predictions and warnings--specifically the performance of the National Weather Service (NWS) during Alicia and, more generally, NWS effectiveness in view of current procedures, proposed changes, and use of NWS services by local officials, the news media, and the public. The hearing on September 24, conducted by the Subcommittee on Water Resources of the Committee on Public Works and Transportation, was focused on an investigation of the damage and recovery efforts associated with Hurricane Alicia.

This summary of these two hearings is divided, accordingly, into two major parts, corresponding to the two sets of issues examined by the respective subcommittees. For each of these two sets of issues addressed at the two hearings, there is included below some general background discussion pertinent to the issues as well as a summary of the relevant testimony of witnesses. Generally, testimony of witnesses at each hearing was addressed to issues of specific interest to the subcommittee conducting that hearing; however, in some cases, witnesses' comments were relevant to issues being investigated more specifically by the other subcommittee at the hearing which a given witness did not attend. Where appropriate, instances of such crossover testimony are identified in this summary of these two separate, but related, hearings.

II. HURRICANE PREDICTION AND FUNCTIONS OF THE NATIONAL WEATHER SERVICE

A. BACKGROUND

1. Hurricane Prediction

Hurricanes, the greatest storms on Earth, begin over tropical waters, but often strike land thousands of miles away, causing deaths, injuries, and extensive property damage. Atlantic hurricanes, born as tropical storms in the eastern Atlantic, move initially in a westerly direction across the Atlantic, then in a generally northern direction, often toward the Caribbean Sea and North America. The storm may grow in intensity as energy and moisture are provided from the warm ocean beneath. If the wind speed reaches 64 knots (nautical miles per hour), the storm is classified as a hurricane.

Atlantic hurricanes occur during the June to November hurricane season--with the greatest frequencies between July and September--but, both the number and the areas of occurrence of hurricanes vary widely each year. While some storms approach and cross over land, others move to the northeast over the western North Atlantic or diminish in severity before landfall. Hurricanes may move erratically and change direction suddenly; they need not strike an area directly to cause severe damage. Three phenomena associated with hurricanes are largely responsible for the devastation which occurs upon landfall: (1) the force of the wind, (2) the storm surge on coastal areas, and (3) flooding which can result from excessive rainfall as the storm moves inland.

In the event of a hurricane, meteorologists are concerned about (1) detection of the storm, (2) observation and monitoring to track its location and structure, and (3) prediction of its future track and structure. Detection and monitoring requires observations from large tropical and subtropical ocean areas, so that the typically sparse conventional meteorological data in those areas are augmented by observations from satellites, coastal radars, and reconnaissance aircraft at the time of a hurricane. The important hurricane characteristics to forecast are its future intensity (wind and rainfall) and its movement.

The Federal Departments of Commerce, Defense, and Transportation—in accordance with responsibilities in the annual National Hurricane Operations Plan—jointly provide the nation and designated international recipients with data, forecasts, and assessments of tropical and subtropical storms. The Department of Commerce, through the National Weather Service (NWS), is responsible for preparation and dissemination of forecasts, warnings, and other information on tropical storms and hurricanes to the general public, to marine and aviation interests, and to other agencies as needed. Geographical areas of particular responsibility for the NWS are those north of the Equator in the central and western Pacific and the Atlantic and Caribbean. The Department of Defense assists the NWS in collection of data, particularly through aircraft storm reconnaissance; and the Departments of Defense and Transportation both provide assistance through dissemination of information.

2. The National Weather Service and Its Functions

The National Weather Service (NWS), located organizationally within the Commerce Department's National Oceanic and Atmospheric Administration (NOAA), has principal responsibility for the operation of civil weather services for the

United States, including basic and specialized weather services. Basic services comprise observation, forecasting, and reporting of weather and flood conditions, including the issuing of advisories and warnings of severe weather events. Specialized services provided by the NWS include the agriculture weather service, the fruit-frost program, aviation weather services, fire weather services, and marine weather services. The basic enabling legislative authorities for the NWS to perform basic and specialized weather services are:

- Organic Act of 1890 created the U.S. Weather Bureau in the Department of Agriculture. (From 1870 to 1890 the Nation's weather services were operated by the Army Signal Corps in the War Department. In 1940 the Weather Bureau was transferred from the Department of Agriculture to the Department of Commerce, where it has remained, but was re-named the National Weather Service when it was incorporated into the National Oceanic and Atmospheric Administration in 1970.);

- Enabling legislation of 1919 allowed the Weather Bureau to enter into cooperative agreements for providing agricultural weather services;

- Flood control Act of 1938 authorized the establishment, operation, and maintenance of the Hydroclimatic Network by the Weather Bureau for flood control; and

- Federal Aviation Act of 1958 outlined the duties of the Secretary of Commerce for provision of weather observations and services to aviation.

Bureau of the Budget (now OMB) Circular A-62, issued November 13, 1963, defines basic and specialized meteorological services and establishes the Department of Commerce (primarily through the NWS) as the principal Federal agency for civil weather services and requires other agencies needing special weather services to coordinate with the Commerce Department on their requirements to prevent duplication. (The Navy and the Air Force also operate large weather services in support of their military operations.)

Operational services of the NWS are provided through a tri-level field structure, consisting of (1) 3 national forecast guidance centers; (2) 52

Weather Service Forecast Offices (WSFOs) and 13 River Forecast Centers (RFCs); and (3) over 250 facilities, including about 200 Weather Service Offices (WSOs), that provide local services. The facilities in this three-level structure and their principal functions are:

- The National Meteorological Center (NMC) at Camp Springs, Maryland, makes large-scale forecasts and develops associated guidance material;
- The National Hurricane Center (NHC) at Miami, Florida, and two regional centers at San Francisco, California, and at Honolulu, Hawaii, prepares specialized forecasts, warnings, and associated guidance for hurricanes and tropical storms;
- The National Severe Storms Forecast Center (NSSFC) at Kansas City, Missouri, prepares specialized forecasts and guidance for tornadoes and severe thunderstorms. NSSFC's National Aviation Weather Unit provides aviation area forecasts as well as advisories to aircraft concerning potentially hazardous weather conditions on their route of flight;
- The 13 River Forecast Centers (RFC) produce specialized river and flood level forecasts and guidance material. Each RFC covers a major national watershed or portion thereof involving several States;
- The 52 Weather Service Forecast Offices (WSFO) prepare and issue medium- and small-scale forecasts, weather watches and warnings; they also acquire meteorological data. There is essentially one WSFO per State;
- The 199 local Weather Service Offices (WSO) issue small-scale forecasts and severe weather warnings; they also acquire and generate meterological and hydrological data;
- Thirty-nine Weather Service Meteorological Observatories (WSMO), 25 Weather Service Contract Meteorological Observatories (WSCMO), and some 600 automated observing stations acquire data;
- Fifty-four of the 251 WSOs/WSFOs with designated Hydrologic Service Area responsibility provide public hydrologic services; and
- Four of the 52 WSFOs have associated Ocean Service Units that prepare regional marine weather and oceanographic products; they coordinate services with other coastal WSFOs.

The NWS National Hurricane Center (NHC) in Miami has responsibility for tracking and prediction of the movement and intensity of Atlantic hurricanes.

NHC issues hurricane advisories (every six hours) and bulletins (between advisories when necessary) whenever a hurricane becomes a threat to the United States. The Center issues a hurricane watch for a definite area and time period to indicate the possibility of a hurricane hitting the area, and, when conditions warrant, a hurricane warning for the area, indicating expected hurricane conditions within 24 hours. The warning may come with less than 24 hours notice if hurricane conditions develop quickly. The NHC coordinates the issuance of hurricane warnings with the NWS National Meteorological Center in Camp Springs, Maryland, and with regional Hurricane Warning Offices at Boston, Washington, New Orleans, and San Juan. NWS Weather Service Forecast Offices (WSFOs) and Weather Service Offices (WSOs) supplement these advisories and warnings with statements which describe expected local hurricane effects and disseminate this information to their local areas of responsibility.

Hurricanes are rated by the NWS on a five-level severity scale (Saffir/Simpson scale) in accordance with wind speed and storm surge height; Category 1 hurricanes are the least severe and Category 5 hurricanes are the most severe. During the 1983 hurricane season the NWS began issuing public hurricane forecasts in the form of probability of anticipated landfall at least 72 hours in advance. These probabilities give the percentage chance that the center of the storm will pass within 65 miles on either side of any of 44 specific locations between Brownsville, Texas, and Eastport, Maine. This probability forecast was first implemented during Hurricane Alicia and is to be included in all future public advisories for Atlantic-area hurricanes.

3. Hurricane Alicia

Alicia moved across the Gulf of Mexico, crossed the Texas coastline at Galveston early on the morning of August 18, 1983, then passed inland striking

Houston with its worst storm in 40 years, before it was downgraded to a tropical storm. An eight-county region of east Texas with three million people received heaviest damage, but effects of Alicia were felt over a wide area through heavy rainfall and tornadoes which were spawned.

The National Weather Service has been generally credited with providing exceptionally good forecasting of Alicia, giving two days advanced warning with adequate time for storm preparations and evacuation where it was felt advisable. First designated as a Category 1 hurricane (wind speeds of 74 to 95 miles per hour), Alicia was subsequently upgraded by the NWS to Category 3 (wind speeds of 111 to 130 miles per hour) just before it reached the Texas coast. As the storm grew to hurricane status, the NWS issued for the first time its probability forecast on whether it would pass within 65 miles of certain Texas cities. The probability of its coming within this range of Galveston increased from 13 percent at 5 a.m. August 16 to 51 percent 18 hours before landfall.

Compared with the infamous hurricane which struck Galveston and eastern Texas in 1900, killing over 6,000 people, only 11 deaths were attributed to Alicia. Property damages resulting from Alicia have been estimated at $1.7 billion. The greatest damage from a U.S. hurricane to date is the estimated $2.3 billion in losses sustained from Hurricane Frederick, which struck the southeastern States in 1979. Doubtless, the relatively few deaths associated with Alicia can be attributed in part to improvements in weather forecasting and dissemination and to emergency preparedness and evacuation plans developed by local communities in consultation with NWS meteorologists.

4. Proposed Changes to the National Weather Service

In recent years, there has been concern on the part of Members of Congress and the public over proposals by the Administration to reduce funding and personnel levels of the NWS. Past proposals to close some of the 200 nationwide Weather Service Offices (WSOs), to downgrade some of the 52 Weather Service Forecast Offices (WSFOs) to WSO status, and to eliminate or reduce a number of the NWS specialized weather services have been resisted by the Congress, which has restored most of the proposed cutbacks through Commerce Department appropriations or continuing budget resolutions. A number of bills and resolutions have been introduced during the 97th and 98th Congresses, establishing criteria for closing weather offices and/or prohibiting the closure of offices unless such criteria are established or designated procedures are followed by the Secretary of Commerce. In the 98th Congress, S. 1097 and H.R. 2900, each authorizing appropriations for NOAA's atmospheric and satellite programs for Fiscal Years 1984 and 1985, and each also containing provisions restricting the closing of weather stations, have been passed by the Senate and House, but both houses have not agreed on a final version of the bill.

The President's Fiscal Year 1985 budget submission, while not recommending closing of any weather stations (except those associated only with specialized services proposed for elimination), proposes overall funding and personnel reductions for NWS of about $12 million and 200 positions. Proposed changes include (as in recent past years) the elimination or reduction of some specialized services, the consolidation of regional headquarters offices, and reduction of personnel (but not closing) at some WSFOs.

OMB Circular A-76 directs Federal agencies to contract activities to the private sector wherever feasible. The Fiscal Year 1985 Administration budget request for the National Oceanic and Atmospheric Administration (NOAA), the parent agency of NWS, includes proposals for such contracts which are both underway and being contemplated. It is projected that, within the NWS, there will be an "A-76 savings" of $1.25 million and 132 positions. Recently, when the House of

Representatives passed H.R. 2900, authorizing appropriations for NOAA's weather, satellite, and marine pollution programs for Fiscal Years 1984 and 1985, the bill included a provision, introduced as an amendment by Representative Michael A. Andrews, which would prohibit contracting out portions of these programs without opportunity for congressional review in order to examine possible impacts on public safety which could occur when certain NOAA activities are contracted to the private sector.

Another matter of concern to the Congress and to many meteorologists and others, both in the United States and throughout the World, was the Administration proposal to transfer operations of the NOAA weather satellites to a private contractor. Though operation of the weather satellites is not an NWS function (they are operated by NOAA's National Earth Satellite, Data and Information Service), the NWS depends heavily on satellite observations and is the greatest "user" of the data. Consequently, there was concern that NWS activities could be adversely affected by transfer of the satellites to a private contractor. After about a year's study of this issue, requests for proposals by the Administration, and numerous congressional hearings, the proposed commercialization of the Nation's weather satellites was temporarily put to rest when Congress passed and the President signed legislation providing appropriations for the Department of Commerce for Fiscal Year 1984 (P.L. 98-166), which included a prohibition of the sale of the satellites.

In June 1983, a report on the organization and management of the NWS, prepared for NOAA under contract (by Booz, Allen and Hamilton, Inc.), was delivered to NOAA. This report, entitled "National Weather Service: A Strategy and Organization Concept for the Future," lays out a new organization and approach for the NWS over the next two decades; it recommends such changes as extensive automation throughout the Service, reduction of the number of weather stations nationwide to between 25 and 50, consolidation of hurricane and severe storm forecast centers with the National Meteorological Center in Washington, elimination of all specialized weather services except on a reimbursable basis to other Federal agencies, and phase-out of NOAA Weather Radio and the AM Weather public television broadcasts.

Specifically, the report recommends that NOAA undertake the following 12 actions to "enhance the efficiency and effectiveness" of the NWS:

- Define the NWS core mission to include only those activities necessary for severe weather warnings and general public forecasts;
- Provide special weather services on a reimbursable basis and only to Federal agencies;
- Install fully automated and remoted surface and upper air observation and remoted Doppler radar systems;
- Reconsider the mix of conventional and Doppler radars based on forecasting requirements and cost/performance;
- Expedite the introduction of broadband communications;
- Encourage dissemination of weather information by the private sector;
- Develop partnerships with State and local governments in the issuance of severe weather watches and warnings;
- Consolidate the national centers;
- Streamline the field structure to significantly fewer offices;
- Consolidate research and development functions to strengthen systems development and implementation of new technologies;
- Identify opportunities for purchasing services from the private sector; and
- Implement these recommendations over a 15-year period.

To accomplish these recommended actions, the contractor report includes the following nine-step implementation plan, designed to "ensure continuity of essential services":

- Establish a transition management team in FY 1984 to oversee implementation;
- Require reimbursement for special weather services by FY 1986;
- Determine the data requirements of the core mission in FY 1985-1986;
- Develop and test major new systems through FY 1988;
- Merge the national centers and consolidate research and development functions in FY 1985-1988;
- Conduct a test of a prototype field office structure during FY 1988 and 1989;
- Determine the precise number and location of field offices by FY 1990-1991;
- Procure and install major new systems through FY 1996; and
- Implement the new field structure in stages from FY 1992 to 1996.

Currently, a NOAA-Department of Commerce management team is reviewing the recommendations of this study, in an effort to assist the Administrator of NOAA in developing a restructuring plan for the NWS. This team is scheduled to submit its recommendations on such a plan in the spring of 1984.

Concerns about the recommendations in the Booz, Allen and Hamilton report to NOAA have been expressed by many. Fundamental to reductions and consolidation recommended are the availability and introduction of technological advances permitting the desired automation; while not opposed to installation of new technology, opponents of the report point out, however, that recent NWS budgetary constraints have prohibited the development and procurement of such technological innovations and that NOAA's principal research program designed to introduce such technology into NWS operations has been curtailed. Others are concerned about the proposed elimination of NOAA Weather Radio and the AM Weather public television programs, the only broadcast services of direct official weather information to the public. Of particular interest to those who are concerned about possible degradation of hurricane prediction and warning services are the recommended consolidation of the National Hurricane Center (NHC) in Miami with the National Meteorological Center and the closings of local weather stations in hurricane-prone areas. Witnesses at the Hurricane Alicia hearings attested to the inestimable value of services provided by the NHC and local WSOs in the Galveston-Houston area prior to and during that emergency.

B. SUMMARY OF TESTIMONY ON HURRICANE PREDICTION AND NATIONAL WEATHER SERVICE ACTIVITIES

1. Effectiveness of the National Weather Service in Forecasting Hurricane Alicia

Witnesses generally agreed that the National Weather Service (NWS) had performed well before and during the Hurricane Alicia emergency. This favorable evaluation was accorded both to the operations and forecasts of the NWS National Hurricane Center (NHC) in Miami and to the services performed by local NWS service offices in Galveston and Houston. These commendations included words of praise by local mayors and emergency management leaders and by local television reporters. NWS meteorologists themselves who testified were gratified that their predictions were so well "on target" and that local emergency plans worked so well so that many lives were saved.

Dr. Neil Frank, Director of the National Hurricane Center, attributed this success to the "tremendous improvement" in the NWS ability to observe hurricanes through satellites, reconnaissance aircraft, and weather radar; but he also emphasized the need for further improvement in hurricane forecasting. Frank observed that there has been a "general erosion" over the past 10 to 15 years in U.S. support for hurricane research.

Mayor E. Gus Manuel of Galveston stated his view a number of times during the hearing that the NWS had done an "excellent job" during Alicia. Testifying that the National Hurricane Center under Dr. Frank had also done well, he expressed his special appreciation for the coordinated effort between his office and the local Weather Service Office in Galveston. Mayor Manuel noted the precision with which the Galveston Weather Service Office had pinpointed the position where the storm was likely to hit shore, and he was impressed by their skill in tracking changes in its direction on the night of August 17, 1983, just before landfall.

A number of witnesses praised local NWS meteorologists not only for their forecasting and warning services during the Alicia alert, but also for their preparation for such an emergency through coordination and planning with local officials. The Coordinator for Emergency Preparedness for the City of Pasadena, Texas, Mrs. Bille Fife, testified that, "Much is to be said for the efforts of area meteorologists for devoting time and energy to obtaining comprehensive knowledge to their area of responsibility--knowing firsthand the responsible officials--making key contacts. Within this framework, we at the local level are confident that we are provided the best of service from the National Weather Service local office and the National Hurricane Center."

Weather Service meteorologists have participated with local officials in formulating evacuation plans and in implementation of a model called SLOSH (sea-lake overland surges of hurricanes) for predicting local flooding from the storm surges associated with hurricanes. With regard to the use of this model and NWS services generally during Alicia, Mr. J. Fletcher Hickerson, Emergency Management Coordinator of Baytown, Texas, testified that:

> . . . the SLOSH predictions showed excellent agreement with observed readings, although this accuracy may not be the same in future events. It is impressive to us that a system of warning has been demonstrated whereby good information flows from the National Hurricane Center, to the local weather office for local action statements, thence to the local emergency management office for specific interpretation, and, finally through the media to the public.

Judge Jon Lindsay of Harris County, Texas, recognized the "invaluable contributions" made by NWS offices in Galveston and Alvin, Texas, during Hurricane Alicia, observing that "the skills and dedication of those involved at these locations cannot be applauded too highly." (Judge Lindsay's prepared statement was presented at the September 24 hearing before the House Committee on Public Works and Transportation, Subcommittee on Water Resources.)

Ed Brandon, Director of Weather Services at Houston television station KTRK-TV, recognized the contributions of Frank and others at the National Hurricane Center (NHC), but had special praise for the valuable services of the local Weather Service offices in Houston and Galveston. During Alicia," he testified, "the performance of our local Weather Service offices was, frankly, better than what most people thought possible."

Tom Siler, of television station KHOU-TV in Houston, contrasted the capabilities for hurricane forecasting and dissemination of warnings by the U.S. Government at the time of the disastrous 1900 hurricane with the improved capability of the NWS 83 years later. Siler also recognized the value of both the National Hurricane Center and local weather service offices, saying "I can be nothing but complimentary about the role of the Hurricane Center in Miami . . . but, I emphasize the role of the local people." He added, "In summary, the Galveston-Houston weather office did a splendid job during the hurricane."

Representative Andrews raised a question about possibly the only alleged deficiency in NWS activities during Alicia, when he alluded to an article in the periodical, Texas Monthly, which had criticized NWS advisories for having omitted information on the extent of hurricane force winds prior to the storm's reaching the coast. Both Siler and Brandon agreed that information on the horizontal extent of the winds had been omitted from the advisories until the storm was near shore (at about 75 miles offshore according to Siler). Neither could explain why this information had earlier been left off the advisories, but both felt it likely that the NWS had done its best and the omission of the wind information was due to circumstances beyond their control, including the possibility that the storm had sprung up so quickly that reconnaissance aircraft could not respond in time. (Apparently the NWS meteorologists had left the hearing when this question arose since the record does not show any questions on this matter addressed to them.)

2. Effectiveness of the National Weather Service Hurricane Rating Systems

Witnesses were asked to evaluate the recently-developed NWS probability forecast system, whereby uncertainties of hurricane track forecasts are expressed. Most witnesses responded favorably to this new system, feeling that it would be a useful device for the public and for officials who must make decisions on implementation of emergency evacuation plans. Some recognized, however, a need for improved public understanding of the probability forecasts before they would be fully appreciated.

Dr. Neil Frank, Director of the NWS National Hurricane Center, stated the purpose of the new NWS probability forecasts, first implemented during the 1983 hurricane season, and evaluated its use during Alicia. He testified that, to help local government officials make critical evacuation decisions, "we introduced a new hurricane probability program this summer, and probabilities were issued for the first time during Alicia." Frank observed that these officials "can now use probabilities to estimate actual risk and initiate evacuation on an objective basis." He noted that "the initial feedback from Alicia suggests the probabilities were quite useful."

Local Houston television newsmen, Ed Brandon and Tom Siler, of stations KTRK-TV and KHOU-TV, respectively, testified on the value to the public, through the media, of this new probability forecast. Brandon was convinced that probability forecasts will be a valuable tool and can save lives as the public gains better understanding of the concept; however, he felt that Alicia was probably not the best test for the new device because the storm arose so quickly, and landfall somewhere near Galveston was nearly certain even with initial warnings. Siler concluded that the percentage forecasting had worked well during both Alicia and Barry and expressed his feeling that people generally understood how to interpret the new scheme.

Pasadena city Emergency Preparedness Coordinator, Mrs. Bille Fife, praised the probability track forecast as "vital planning data," testifying that "the National Weather Service added yet another valuable input for local decision makers in 1983 by issuing probabilities." Mayor E. Gus Manuel of Galveston was not so certain as the other witnesses of the current value of the new probability forecasts. While not critical of the new concept, he expressed doubt that the public as yet understood it, but conceded that in perhaps a few years there will be greater public understanding and appreciation of its meaning and implications.

In addition to their testimony on the value and effectiveness of the new NWS hurricane track probability forecasts, witnesses also discussed the NWS five-level hurricane severity scale (Saffir/Simpson scale), which has been in use by the NWS for some years. Sometimes there appeared to be confusion between the severity scale and the probability forecasts as the term "formula" was used to refer to both.

Dr. Frank noted the success that the NWS has had in applying the Saffir/Simpson scale, which rates hurricane strength from one (lowest) to five (greatest), observing how effective it had been in helping officials and the public place storm severity in proper perspective. In the case of Alicia, he recalled that the storm, initially in Category 1, had increased in severity to Category 3 during the final hours before the "eye" moved across the western part of Galveston Island. Steven W. Harned, Meteorologist-in-Charge at the Weather Service Office in Houston, also thought the severity scale useful, though initially it was of less value in the case of Alicia, since that storm remained at level one for so long a period before its sudden increase just before landfall. He urged that, whenever a scale is assigned to a storm, a footnote be included, indicating the unpredictability of hurricanes and the possibility of change in severity at any time.

J. Fletcher Hickerson, Emergency Management Coordinator of Baytown, and Mrs. Fife both saw the Saffir/Simpson scale as another valuable planning tool for local officials, inasmuch as it gives indication of relative storm severity and possible damage. Mr. Hickerson asserted that, when the scale is used in particular by the media, more emphasis should be placed on the description of potential damages which could result.

Television weather reporters Siler and Brandon did not see the particular value of the severity scale during Alicia, owing largely to the rapidity with which the storm changed categories just before landfall. Brandon noted that most of the interest in categorizing Alicia occurred after the hurricane had passed.

3. Sources of Weather Information and How Information is Used by Local Officials

Representatives Scheuer and Andrews raised questions about the adequacy of weather information for emergency decisions and for long term planning by Government officials. They were also concerned about how well such information is communicated by the NWS to local officials, the media, and the public.

Recognizing current shortcomings in the state-of-the-art in weather forecasting, witnesses generally acknowledged the adequacy of weather information--in terms of quality, quantity, and timeliness--for decisionmaking during weather emergencies such as Alicia and for longer term planning. In addition, witnesses repeatedly identified the cooperation of, and coordination with, NWS personnel as an invaluable ingredient in the successful application of weather data by local officials and the media. This cooperation and coordination has been extended by meteorologists from local Weather Service offices as well as by experts from the National Hurricane Center in Miami, who have participated in development of emergency plans. National Hurricane Center meteorologists also meet with local emergency management officials in annual hurricane preparedness meetings, usually each May before the start of the hurricane season. Bille Fife and J. Fletcher Hickerson, emergency management coordinators for Pasadena and Baytown, Texas, respectively, and Galveston Mayor E. Gus Manuel attested to the value of these annual meetings as well as a number of smaller meetings with NWS meteorologists each year in which hurricane emergency information is exchanged.

Witnesses observed that "close ties" between NWS personnel and local officials are valuable, not only for purposes of long term planning and participation in evacuation studies; they also stressed the acute need for such ties during an actual storm emergency. According to Steven W. Harned, NWS Meteorologist-in-charge in Houston, however, the ability to maintain such direct local contacts with local community officials is limited during the storm, owing to the lack of a communication system in the Galveston-Houston area which would allow the NWS to talk with all the local officials at the same time. Consequently, Harned was obliged to restrict direct communication to officials in those local communities in greatest danger at a given time. He noted the value of NOAA Weather Radio and local media in providing information on Alicia to other area decisionmakers and to the public.

Local officials testified that NWS data is their authoritative source of information for decisionmaking during weather emergencies. Galveston Mayor Manuel stated that his office relies on first-hand information received from the NWS at such times. Pasadena city Emergency Preparedness Coordinator Fife observed that information from the NWS is received in their Emergency Operations Center directly by teletype and tone alert weather station monitors, along with output from the storm-surge model SLOSH and NWS data received via teletype from the Texas Department of Public Safety, Division of Emergency Management. When conditions warrant, there are also telephone conversations between her office and the local Weather Service Offices. She emphasized, however, that the NWS provides advice and recommendations only; local officials must make the decisions. Baytown Emergency Management Coordinator Hickerson related the several ways in which his office receives information from the NWS. Hurricane bulletins and probabilities are received by teletype and by radio from the Houston weather office and from the National Hurricane Center. Telephone conversations with the Houston office, as appropriate, and the weather TV channel also provide useful information during an emergency. In accordance with a hurricane evacuation plan adopted by Baytown, areas in danger will be evacuated when NWS information indicates that an area will be flooded.

Current weather data is an essential input to the storm-surge model SLOSH, whose successful water-level predictions can be attributed largely to participation of NWS scientists in its development and tailoring it to fit a number of local U.S. coastal areas, including Galveston Bay. This model provides predictions of water levels resulting from expected hurricane storm surges, essential information used by local authorities in deciding whether or not to activate evacuation plans or other emergency measures. Both Hickerson and Fife noted the usefulness of SLOSH predictions. Hickerson explained that SLOSH provides detailed information on storm surge for four locations in Baytown. This information is used in a plan, which may call for evacuation of any of these areas subject to flooding; the plan using SLOSH, can be activated in accordance with specific information from the NWS. Predictions from the SLOSH model are used by Hickerson and others "in house" for decisionmaking; they are not given directly to the public.

Ed Brandon of Houston television station KTRK-TV observed that, during Alicia, there was a "symbiotic" relationship between local NWS personnel and the local news media. He stressed the necessity of receiving weather information from the National Hurricane Center and from the Houston and Galveston NWS offices, testifying that, at his station, the "primary and most essential source" of weather information is the NWS. Brandon explained that information he obtains from the local NWS offices and from the National Hurricane Center is "well-composed and easily understood." In response to a question from Representative Andrews on whether or not there is a lag time between generation of storm information and the availability of that information to the media and others, Brandon identified the NWS weather wire as a "slow link" in the system, suggesting that high-speed printers should become standard NWS equipment instead. Tom Siler of

Houston television station KHOU-TV testified that the "most important weather information" comes from local forecasters.

4. Problems which Could Arise in Translation of Storm Predictions from the Primary Sources to the Media for Widespread Distribution

On this general question of interpretation and possible misunderstanding of NWS forecasts there were a number of opinions from the various witnesses. Steven M. Harned, NWS meteorologist-in-charge in Houston, observed that two NOAA Weather Radio (NWR) stations were broadcasting in the Houston-Galveston metropolitan area during Alicia, providing the fastest source of weather information. He testified that new statements or warnings were placed on these radio stations as soon as they were issued, so that information on the storm was neither delayed nor edited.

Dr. Neil Frank, Director of NOAA's National Hurricane Center, while expressing his concern about possible public confusion arising from multiple forecasts of severe weather, observed that there is often a tendency for the public to accept, from a number of predictions, the opinion that tends to minimize potential danger. More particularly, Frank noted that the public appears to misunderstand information about the "eye" of a hurricane, feeling this to be the most severe part, and that, if the eye is reported to pass somewhere else, there is relative local safety. He explained that the hurricane is not just a point, but has dimensions and that, whereas the eye is the center of the storm, it is a region of relative calm compared with the region of severe winds surrounding the eye. He recalled that some radio stations had been broadcasting that the eye of Alicia was going to cross the coast at Freeport, thereby implying that Galveston would be relatively safe.

Frank also felt that there may have been some complacency when the public learned initially that Alicia was only a Category 1 hurricane. He observed that, when the severity scale had been first developed, it was intended to be used publicly only when a storm was very severe, stating, "Then we were going to say, 'Folks, this is a 4 or 5. This is the most you have ever expected to have; you better respond'."

Television weather reporter Tom Siler confessed that there is often a tendency among the news media to "over forecast" the NWS report. He cited, e.g., the case of forecasting snow, where, "If the Government says three inches, you say five." Siler was concerned about warnings from private forecasting services which may be located at a great distance from a severe weather event such as a hurricane. He noted also the tendency of radio stations to provide frequent forecasts by filling in information, for public interest, between forecasts which the Government provides.

Ed Brandon, another television weather broadcaster, testified that the NWS, both in their local offices and at the National Hurricane Center, were, especially during Alicia, "very good at composing and gathering information so that it is easily understood." He explained that the job of the television weather news reporter was to organize and edit the NWS forecasts to make them more relevant for his audience, while trying to pass along as much as possible the information thought to be important by the weather experts.

Galveston Mayor, E. Gus Manuel, reported a dramatic case in which information on Hurricane Alicia had been distorted and sensationalized. He testified of having received telephone calls from Oklahoma in which he was informed that it was erroneously reported there that his city, Galveston, had been destroyed by the hurricane. As a result, Galveston had suffered unnecessary economic losses subsequently, as 25,000 tons of cargo were not shipped through Galveston and hotels and restaurants lost business.

5. The Role of the Private Sector in the Issuing of Severe Weather Warnings

Of concern to the committee were two questions relating to the dissemination of severe weather warnings by the private sector. One issue is whether or not private weather forecasters ought to provide such warnings to the public, in addition to the warnings prepared by the NWS, leading to possible confusion as to the meaning of the forecasts and to contradictory advice with regard to hurricane preparedness and possible evacuation. The second issue was whether the private sector should be called upon to provide such warnings instead of the NWS; i.e., should the Government function of providing severe weather warnings be contracted out? These two issues were not always distinctly addressed by the witnesses; testimony on these two aspects of private sector activity were often intertwined with each other and with discussion of other issues raised.

Dr. Neil Frank, Director of the National Hurricane Center, spoke explicitly to the problem of multiple warnings by the NWS and by the private meteorological sector, with the attendant possibility for public confusion. He observed that, not only could such multiple opinions cause confusion, they may also cause delay in decisionmaking. In response to a specific question from Representative Scheuer on whether there had been, or might have been, confusion during Alicia from unauthorized or inaccurate warnings, Frank testified that multiple warnings were not a problem during Alicia, with the one exception that some radio stations had broadcast that the storm was going to Freeport and that Galveston, therefore, need not worry. Dr. Frank recognized that the NWS might sometimes be in error just as could a private forecaster, but he emphasized that, in such a national disaster as a hurricane, the mobilization of a community must be maximized most effectively and that there must, therefore, be "one voice." This one voice could, in fact, be either a Government voice such as that of the NWS or it could be that of a private sector contractor authorized by the Government for that purpose.

Tom Siler of Houston television station KHOU-TV also expressed his opinion that, in a hurricane threat, "there has to be one voice, right or wrong--otherwise there is going to be mass confusion." He noted how such confusion would tend to result from competing television stations, each trying to outdo the others and each using competing private weather service companies that seek to be a little different from each other in order to show their unique capabilities. Ed Brandon, of television station KTRK-TV, testified that, in the case of Hurricane Alicia, he had not observed any differences between broadcasts which were based on forecasts from a number of private meteorological firms, each of which was passing along as well the official bulletins of the National Hurricane Center.

In her prepared testimony for the hearing, Billie Fife, Emergency Preparedness Coordinator for Pasadena, reported one glaring incident, of which she was aware, of a contradictory report from a private forecasting service. Someone from a Texas city nearby, who subscribes to a private service, had telephoned her office with the information that Hurricane Alicia would landfall much further south, at Corpus Christi. Another emergency management coordinator, J. Fletcher Hickerson of Baytown, averred that the preparation, planning, and relationships which were in place prior to the hurricane could only have been accomplished through interaction with a single weather agency, which provides uniform information.

Representative Scheuer posed the second question regarding the propriety of the private sector providing severe weather warnings; i.e., what would be the impact of commercialization or privatization of severe weather forecasting and warning services? Dr. Frank asserted that, not only must there be "one voice" at the time warnings are issued, but there must be only one meteorological voice in the community. This party must be involved in all phases of planning and coordination with local officials as local NWS offices now do. He felt that this community involvement might be difficult for a private contractor.

Both television newsmen Siler and Brandon were also concerned about implications of private forecasters taking over the weather services functions of the Federal Government. Brandon was especially worried that one company could get control of, and monopolize weather data.

6. Possible Impairment of National Weather Service Functions which Could Result from Proposed Reductions in Weather Service Offices and Personnel

Representative Scheuer expressed his concern over possible negative effects of budget and personnel cuts in the National Weather Service, contending that the NWS has been "stretched to the breaking point," as funding has not kept up with inflation, and personnel levels have decreased by more than 300 positions since 1970. He noted Administration proposals to close many local weather stations and to eliminate "traditional" services such as agricultural weather services and frost warnings.

It was Representative Andrews' opinion that Administration proposals for NWS consolidations (and its recent proposal to sell NOAA's weather satellites, too) were "ill-conceived and could have disastrous consequences from both a budgetary and public safety standpoint." He decried proposals being considered by NOAA in a contractor-prepared NWS management study, which recommends closing of over 260 weather stations across the country and elimination of NOAA Weather Radio, observing that while the "planners" are urging complete automation of weather forecasting, the meteorologists who do the forecasting oppose such a proposal.

When asked to give their opinions on whether or not NWS functions would be impaired by these proposed consolidations and reductions in force, every witness at the September 23 hearing (before the House Committee on Science and Technology, Subcommittee on Natural Resources, Agriculture Research and Environment) and a number of witnesses at the September 24 hearing (before the House Committee on Public Works and Transportation, Subcommittee on Water Resources) expressed concern over possible reductions and/or consolidations in the Weather Service, recognizing the possible closings of local weather stations in the Galveston-Houston area and contending that such curtailments would result in degradation of services to the region.

Concern of witnesses over closing of local weather stations was based not only on feared curtailment or elimination of local sources of weather information, with consequent possible degradation of NWS warnings during an emergency such as Alicia. Their concern also stemmed from the possibility of inestimable losses in longer term coordination and community planning between local public officials and local NWS personnel who live in, and are familiar with, the local communities which they serve.

Both Steven Harned, Meteorologist-in-charge of the Houston Weather Service Office, and Dr. Neil Frank, Director of the National Hurricane Center, emphasized the value and need for this local coordination and participation of NWS personnel over a long time in planning for major weather disasters like hurricanes. Referring to the preparation prior to, and the response during, Hurricane Alicia, Frank noted the contributions of local NWS offices, saying, "I just don't believe if you centralized your forecasting in some remote location, that you are going to have the effectiveness that was demonstrated here in this particular storm . . . our people were involved in helping develop the plans, and we knew what was going to happen. And when that storm began to threaten, it was a very easy thing to shift gears and to call over to those local government officials who are responsible for initiating action. . . ." Frank emphasized that, if in the future there is to be minimization of the loss of life from severe weather, there must be greater, not less, local coordination.

Harned asserted that, though having seen only "executive summaries" of the NOAA contractor-prepared management study of the NWS (the study by Booz, Allen, and Hamilton), he had two major concerns about changes in the NWS recommended by the study. First, he doubted whether suitable technology necessary for the proposed automation of the NWS would be available in the next 10-15 years. His second reservation was expressed in his opinion that, with a possible reduction under this plan from the current 18 stations to only 2 stations for all of Texas, there would be the loss of valuable local contact between meteorologists and the communities and counties now served by these local stations. Harned was also concerned about the recommended closing of NOAA Weather Radio (NWR) stations, testifying that this service is the "best direct link" between the NWS and the public, provided now through a nationwide network of 371 NWR stations.

Television news weather reporter Ed Brandon averred that, should the Federal Government consider closing local Weather Service Offices in Houston and Galveston, after the services they provided during the Hurricane Alicia emergency, there would be "serious confrontation" with government, industry, and the media in that area. In reply to a specific question about the proposed shutdown of the NWS radar station at Galveston, Brandon noted its particular value and stated his objection to such a closing. Tom Siler, the other television weather reporter at the hearing, also testified to the particular value of local NWS meteorologists and objected to Federal cutbacks that have already reduced the number of NWS personnel in the Galveston-Houston area to the point where communication with the public has suffered.

Local officials were particularly disturbed about possible Weather Service consolidations and closings of local weather stations with a view to automation. Galveston Mayor Manuel suggested that, rather than thinking of closing the Galveston Weather Service Office, consideration should be given by the Government to improving its facilities. Billie Fife and J. Fletcher Hickerson, local emergency management coordinators in Pasadena and Baytown, respectively, also emphasized the need for maintaining nearby weather offices, stressing the desirability in the event of a severe weather emergency for consultation with meteorologists who have knowledge of the local areas in which they serve.

At the September 24 hearing (before the House Committee on Public Works and Transportation, Subcommittee on Water Resources), Galveston City Manager, Stephen N. Huffman, expressed his opinion on the importance of maintaining an NWS office, including the weather radar, in Galveston. He cited the substantial cost from potential damage which could result from possibly inadequate weather warnings in the future. At the September 24 hearing, similar opposition to closing local weather stations was also presented in a prepared statement from Harris County Judge Jon Lindsay and in testimony from Texas State Coordinator for Emergency Management, Robert Lansford.

III. DAMAGE AND RECOVERY EFFORTS ASSOCIATED WITH HURRICANE ALICIA

A. BACKGROUND

1. Historical Perspective on Earlier Disaster Relief Provisions

Not until 1950 did Congress adopt the first comprehensive disaster relief measure. However, since early in the 19th century, numerous special acts were passed from time to time providing minimum amounts of help in areas subjected to catastrophic losses. Until recent decades, such assistance consisted mainly of emergency supplies or funds appropriated after severe floods, storms, or other such calamities, but since the World War I period various types of agricultural disaster loans have been authorized. Since then also Federal benefits to disaster victims have been greatly expanded, especially in the past three decades.

Loans to farmers for losses caused by floods and droughts began as early as 1916 and were continued by a number of special acts in the 1920s. Beginning in and continuing since the 1930s, emergency agricultural loans for disaster losses have been provided by several agencies in succession: Reconstruction Finance Corporation (1932); Farm Credit Administration (1933-46); Regional Agricultural Credit Corporation (1948-49); Secretary of Agriculture (1949-51); and the Farmers Home Administration (1951-present). Similarly, non-agricultural loans for disaster losses to homes, businesses and other private property have been available under varying conditions from such agencies as the Reconstruction Finance Corporation (1933-53), Disaster Loan Corporation (1937-45), Federal

Housing Administration (1936), Office of Defense Mobilization (1955), and since 1953, the Small Business Administration.

At various times in the past half century, Congress likewise has extended particular types of aid for disaster losses suffered by publicly owned facilities. Grants to States have been authorized since 1934 for the repair and reconstruction of highways and bridges on the Federal-aid system that are damaged by disasters. The Army Corps of Engineers (since at least 1941) has been authorized to spend funds for the maintenance and repair of flood control works threatened or destroyed by floods. In 1947, Congress authorized (P.L. 80-233) the transfer of surplus Federal personal property without compensation to State and local governments in areas damaged by a "flood or other catastrophe." A year later it appropriated $500,000 (P.L. 80-785) for the President to use in supplementing State and local government recovery efforts if he determined that any "flood, fire, hurricane, earthquake, or other catastrophe" was of sufficient severity to justify such help.

2. Disaster Relief Legislation Since 1950

The 1950 Disaster Relief Act (P.L. 81-875) incorporated certain features of the 1947 and 1948 laws and in turn became the pattern for basic concepts adopted in subsequent legislation. Although both the kinds and amounts of assistance the President is authorized to provide in major disasters were increased by later amendments and new acts, all of them have embodied the following principles: (1) a major disaster (and after 1974 an emergency) can be declared by the President only for causes specified in the law; (2) the President must determine that the event is so large and so devastating that Federal aid would be justified; (3) the State Governor must certify to the need for assistance and give assurance that reasonable relief expenditures will be made by the affected State and local governments; and (4) Federal assistance is considered to be supplementary to and not a complete replacement for State and local recovery efforts.

Federal disaster assistance provided by the 1950 Act was limited, with few exceptions, to minimizing immediate danger, alleviating emergency suffering and damage, and helping to restore public services and facilities. The causes for which a major disaster could be declared included any "flood, drought, fire, hurricane, earthquake, storm or other catastrophe" which the President determined to be of sufficient severity and magnitude to warrant assistance. In any such disaster, the President was authorized to direct Federal agencies to utilize or lend their equipment, supplies, personnel and other resources without compensation, to distribute medicine, food and other supplies, and to donate equipment and supplies to State and local governments. He was also authorized either to perform on public or private lands, or to make contributions to State and local governments for the purpose of performing, protective work to preserve life and property, to clear debris and wreckage, and to make emergency repairs and temporary replacements of damaged or destroyed public facilities in local governments.

Numerous changes have been made since 1950 in disaster relief legislation and in implementing regulations. Extensive amendments were adopted in 1966 (P.L. 89-769), 1969 (P.L. 91-79), and 1971 (P.L. 92-209), and entire new acts were passed in 1970 (P.L. 91-606), and 1974 (P.L. 93-288). Other important disaster-related laws enacted by Congress include the National Flood Insurance Act of 1968 (P.L. 90-448), the Elementary and Secondary Education Amendments of 1967 (P.L. 90-247), and the Flood Disaster Protection Act of 1973 (P.L. 93-234). In addition, several acts passed in recent years have increased the amount and have raised or lowered the interest rates of Small Business Administration and Farmers Home Administration disaster loans.

Legislative actions since 1950 have resulted in several significant developments such as the listing of additional causes for declaring a major disaster, authorizing a new type of "emergency" disaster, providing subsidized flood insurance, extending eligibility for disaster aid, and increasing the kinds and amounts of benefits for both the public and the private sectors. There is no need to enumerate here all of the changes adopted in these various acts, but the following brief chronological summary of the more important policy innovations may be useful.

1951. Temporary housing or other emergency shelter authorized for families displaced by major disasters.

1962. Guam, Samoa, and Pacific Trust Territory made eligible for disaster assistance. Emergency repair and temporary replacements authorized for damaged or destroyed State-owned facilities.

1964-65. Special aid provided by three acts for damages caused by the Alaskan Earthquake, Pacific Coast flooding, and Hurricane Betsy in Gulf States.

1965. Grants or loans authorized to help repair or reconstruct public elementary and secondary schools damaged in a major disaster.

1966. Loans by the REA, VA, and HUD could be adjusted because of disaster losses. Authorized grants or loans to repair or restore disaster damaged facilities of higher educational institutions. Secretary of Agriculture authorized in certain cases to make grants not to exceed 50 percent of the cost of repairing or reconstructing waste disposal systems, water systems, and other public facilities damaged in a major disaster in rural areas.

1968. Established subsidized flood insurance to help protect property owners in identified flood hazard areas of local communities which adopt certain minimum land use measures. Program modified in 1973.

1968. Aid was authorized for public schools damaged in a localized or "pinpoint" disaster not located within a major disaster area. However, regulations to implement this were not issued until 1976 and apparently little such aid has been provided.

L

1969. Provided grants for up to 50 percent of the cost for repairing or reconstructing non-Federal-aid highways damaged in a major disaster. Cancelled repayment of $1,800 after the first $500 of SBA and FmHA disaster loans. Authorized grants to States of up to $250,000 for not to exceed 50 percent of the cost of developing comprehensive disaster preparedness plans and programs. Rentals for temporary housing provided for disaster victims could be compromised, adjusted or waived for periods up to 12 months and would not exceed 25 percent of a family's income. Food coupon allotments were authorized to be distributed to low-income households unable to purchase adequate food because of a major disaster. The President was authorized to provide assistance to persons unemployed as a result of a major disaster. Grants were authorized to States to help suppress fires on publicly or privately owned lands, and to remove debris deposited in a major disaster on public or private waters as well as on land.

1970. The definition of a major disaster was expanded to include four additional causes: tornado; high water; wind-driven water; and tidal wave. The President was authorized to use or to make available the facilities of the civil defense communications system for warnings of imminent disasters, to use Federal resources to avert or lessen the effects of a disaster before its occurrence, and to provide temporary communications facilities and transportation services in a major disaster area. Temporary housing was authorized to be provided without charge for disaster victims for a period of up to one year. The amount of SBA and FmHA disaster loans which could be cancelled was raised from $1,800 to $2,500 after the first $500, and the age of an adult applicant for such a loan was not to be considered in determining whether it should be issued. Community disaster grants were authorized for local governments suffering substantial tax losses because of a major disaster, and the SBA and FmHA were authorized to make special loans to any industrial, commercial, agricultural, or other enterprises which were major sources of employment but were no longer in substantial operation because of major disasters. Federal contributions not to exceed 100 percent of the cost of repairing or reconstructing disaster damaged public facilities were authorized to be made to State and local governments.

1971. Grants were authorized for up to 100 percent of the eligible costs for repair or reconstruction of non-profit, privately-owned medical care facilities damaged or destroyed in a major disaster.

1972. Grants were authorized for up to 100 percent of the losses inflicted by Hurricane Agnes on non-profit, privately owned educational facilities. For disaster loans by SBA (January 1, 1972 to July 1, 1973) and by FmHA (June 30, 1971 to July 1, 1973), the interest rate was lowered to 1 percent and up to $5,000 of the principal could be cancelled.

1973. The interest rate on SBA and FmHA disaster loans was raised to 5 percent and the $5,000 cancellation feature was terminated (P.L. 93-24). This action was taken by Congress on April 26, 1973, applying to SBA loans made after that date and retroactively to FmHA loans made since December 27, 1972, when they had been suspended by the agency, some months before these features would have expired (P.L. 93-24). The discrepancy in the time period for FmHA loans was remedied later by legislation providing that the 1 percent interest rate and $5,000 cancellation could be reactivated for loans made by the Secretary of Agriculture before April 20, 1973 (P.L. 93-237).

1974. Six additional causes were included as reasons for which a major disaster could be declared: tsunami, volcanic eruption, landslide, mudslide, snowstorm, and explosion. The President was authorized to declare an "emergency" disaster rather than a major disaster, the effect of which would be to permit Federal agencies to take steps to protect life, health and property and take other emergency actions, but which would not extend all of the different types of aid provided in a major disaster. The President was also authorized to establish a Federal disaster preparedness program, using all appropriate agencies for disaster mitigation plans, warning systems, and emergency operations. One-time grants not exceeding $250,000 without a matching requirement could be made to states for the preparation of comprehensive disaster preparedness plans. Any State or local public facility for which disaster assistance had been provided previously was excluded from aid in any future disaster unless in the meantime any reasonably available insurance had been obtained on that facility. Criminal and civil penalties were required for the first time in disaster legislation for committing fraud, violating orders or regulations, or knowingly misapplying loans or benefits. All public educational and recreational facilities, as well as private, nonprofit educational, utility, emergency, medical, and custodial care facilities, and those located on Indian reservations, were made eligible for assistance up to 100 percent of the cost for repairs or reconstruction if they were damaged or destroyed in a major disaster. State and local governments were given the option, instead of receiving a separate grant for each damaged facility, of accepting an overall in-lieu contribution based on 90 percent of the total estimated cost of restoring all damaged public facilities within their jurisdiction, a decision which would permit using Federal funds either to restore certain selected projects or to construct new facilities to meet their needs. Community disaster loans were authorized for any local government in a major disaster area that suffered a substantial loss of tax and other revenues and that demonstrated need for assistance to perform governmental functions. Instead of providing temporary housing for disaster victims, expenditures for certain minimum repairs to restore disaster-damaged, owner-occupied private residences to an habitable condition were

> authorized. Professional counseling services were authorized for mental health problems caused or aggravated by a major disaster. The President was directed to assure that adequate stocks of food would be ready for emergency feeding and distribution in any major disaster or emergency area and the Secretary of Agriculture was directed to purchase food commodities for that purpose. Grants were authorized to States to provide 75 percent of the actual State cost in providing disaster-related necessary expenses or for serious needs of individuals or families adversely affected by a major disaster, with a maximum limitation of $5,000 for any individual or family under the program. Enacted also in 1974, but never funded by Congress nor implemented, was a special new, long-range economic recovery program for areas adversely affected by a major disasters.

3. The Role of the Army Corps of Engineers in Disaster Assistance and Prevention

The U.S. Army Corps of Engineers has programs both to provide emergency assistance in the aftermath of a disaster, and to prevent similiar disasters in the future. The flood emergency operations and disaster assistance program helps communities during and immediately after a disaster.

a. Emergency Disaster Assistance

The 1941 Flood Control Act (P.L. 84-99), as amended by section 206 of the 1962 Flood Control Act (P.L. 87-874), established the Corps of Engineers program for flood emergency operations and disaster assistance. Through this program the Corps of Engineers provides supplementary assistance to local efforts and capabilities in the protection of federally authorized protection structures damaged or destroyed by wind, wave, or water action. State and local governments must use their own resources to the maximum extent feasible, usually including the furnishing of common labor. Requirements for provision of this emergency assistance are a declaration of a state of emergency or written request of the Governor of the State.

Emergency assistance which the Corps may provide under this program are flood emergency preparation, flood fighting and rescue operations, emergency repair and restoration of flood control works; and protection, repair, or restoration of federally authorized hurricane and shore protection works. Section 82 of P.L. 93-251 amended this program to authorize the Corps to provide emergency supplies of clean drinking water to any locality threatened with contaminated drinking water which is a threat to public health.

Section 14 of the Flood Control Act of 1946 (P.L. 526 in the 79th Congress) provides the Corps of Engineers authority to undertake emergency measures to prevent erosion damages to endangered highways, public works, and non-profit public facilities.

b. Disaster Prevention

Other Corps of Engineers programs, such as the construction of flood control, drift and debris removal, beach erosion control projects, and the provision of flood plain management services, can help prevent future floods, but would not be helpful in a flood emergency. (However, some flood control projects have been criticized for not accomplishing their flood control objectives.) Before any of these projects may be constructed, the Corps must obtain formal assurances from local sponsors that they will pay their cost-share of the project.

Congress selects water projects, including flood control projects, through a two-phase authorization and construction appropriations process, which follow preliminary congressionally mandated studies indicating the technical feasibility of the project. In the authorization phase, Members of Congress vote collectively on a group of new water projects in the "omnibus" rivers and harbors bill. In order to qualify for inclusion in the authorization bill, a project normally must have a benefit-cost ratio greater than unity. Congress normally enacts water project authorization legislation every two years, but it has been seven years since the last water projects authorization was enacted. After the authorization phase, Congress then selects many of these projects for the construction appropriations phase. Again, this is a process where Members of Congress vote up or down on a list of projects. Construction appropriations normally occur annually.

Drift and debris removal projects may be authorized through this process. Section 202 of the 1976 Water Resources Development Act (P.L. 94-587) provides authority for the collection and removal of drift and debris from publicly maintained commercial boat harbors and from adjacent waterway areas.

The Corps of Engineers also develops beach erosion control projects. The Coastal Energy Research Center conducts beach erosion research and undertakes protection projects. The Federal Government pays the cost of the studies, while the Federal and non-Federal interests share the construction costs.

4. The National Flood Insurance Program

The impetus behind the initiation of the National Flood Insurance Program (NFIP) was a desire both to decrease Federal payments for flood relief and provide property owners reasonable insurance protection against the worst floods. A key element in the program is defining the flood plain and providing the incentives for limiting development in the flood plain. The program was authorized in 1968 (National Flood Insurance Act, Title XIII of the Housing and Urban Development Act, P.L. 90-448), and has been amended several times since then. Responsibility for management of the program resides with the Federal Insurance Administration (FIA), an agency within FEMA.

Under the original program, insurance was not available until a detailed and time-consuming flood insurance study was completed. This study was necessary so that insurance companies could establish actuarially sound rates and determine the elevation level at which new construction would be reasonably safe from flooding. The technical studies required by the program severely restricted the entrance of communities into the program.

To overcome this problem, Congress amended the program to provide an "emergency" program in addition to the regular program. Under the emergency program, the Federal Government subsidized the sale of flood insurance in a community as soon as it had accepted the community's application, but before the required technical studies were complete. Even with the emergency program, the fact that a community's participation in the program was volountary led many eligible communities to not participate in the program, thus leading to continued development of flood plains.

The 1973 Flood Disaster Protection Act (P.L. 93-234) provided incentives for more communities to participate in the program. Property owners in communities participating in the NFIP would continue to be eligible for federally assisted or guaranteed loans for new construction or mortgages on existing buildings. Property owners in flood hazard designated, but non-participating, communities, however, would not be eligible for these federally assisted or guaranteed loans.

The 1977 Amendments (contained in Title VII of the 1977 Housing and Community Development Act, P.L. 95-128), responding to criticism of the "mandatory" nature of the program after the 1973 amendments, removed the requirements prohibiting owners of property in non-participating communities in designated flood-prone areas from receiving loans from federally insured or regulated private lending institutions. The amendments also provided that in the emergency phase communities could secure a basic level of coverage, even though the necessary flood insurance elevation and actuarial rate studies had not been completed, on condition that the community had adopted minimum flood plain management requirements.

The 1981 amendments (1981 Omnibus Reconciliation Act, P.L. 97-35) amended the program by prohibiting the sale of flood insurance on undeveloped barrier islands identified by the Interior Department. The City of Galveston is on a developed barrier island, and therefore does not fall under this prohibition. The Bolivar peninsula--just north of Galveston--falls under this prohibition.

The 1983 amendments (Part B of Title IV of the 1983 Domestic Housing and International Recovery and Financial Stability Act, P.L. 98-181) to the program required that the FIA must submit to Congress a plan for bringing all communities in the emergency phase of the program into the regular phase, a report on the program's premium rate structure, and an explanation of any anticipated rate increases.

The philosophy of the current Administration is to make the National Flood Insurance Program actuarially sound--that is, to remove the Federal subsidy from the program. Three approaches it is taking for implementing this goal are restricting insurance coverage in basements, changing the deductibles policy to provide a wider range of options, and eliminating coverage or raising premium rates in certain contexts, such as coastal "high velocity" zones.

5. The Role of the Small Business Administration in Disaster Assistance

The Small Business Administration (SBA) has two types of loan assistance for disasters declared by the President, the SBA Administrator, or the Secretary of Agriculture. In certain situations where no such declaration has been made, SBA can provide disaster assistance after the Governor of the affected State provides a certification of need.

a. Physical Disaster Loans

The first type of loan is the physical disaster loan for use in the repair, reconstruction, or replacement of the victim's residence or business property. In addition to owners of homes and businesses, other eligible applicants are residential tenants, non-profit organizations, and agricultural producers ineligible or unable to obtain disaster assistance from the Farmers Home Administration. The maturity of the loans is limited to thirty years, and the interest rates vary. When the disaster event causes 30 percent or more damage of the predisaster fair market value of residential or business or residential property, prior recorded mortgages may be eligible for refinancing.

Included in the residential coverage are furniture and other eligible household effects and personal property. Not included in residential coverage are secondary homes, their contents, or personal property used primarily for recreation or relaxation. Included in the business coverage are inventory, furniture, fixtures, machinery, equipment, leasehold improvements used in a business, and crops and livestock of eligible agricultural producers.

The maximum amount of residential disaster loans is $50,000 for restoration and $10,000 for contents, or $55,000 for both. The limit for eligible refinancing is $50,000. The maximum amount of business disaster loans is $500,000 for real and personal property loss, although higher amounts may be obtained for major sources of employment. Portions of business disaster loans used for repair or replacement of damaged property are limited to 85 percent of the verified losses.

The interest rate for residential and business disaster loans varies. The basis for residential loan interest rates is the "credit elsewhere" test, with applicants able to obtain other financing without undue hardship paying a higher rate. For applicants unable to obtain credit elsewhere at reasonable rates, the SBA limits the interest rate to 8 percent, or a formula comprised of the Government's cost of borrowing plus up to one percent, whichever is lower. As of January 1, 1983, the formula rate was the lower at 5 and 7/8 percent. For residential applicants able to secure alternative financing, the rate is not to exceed a different formula rate comprised of the "full cost" of money plus up to one percent. As of January 1, 1983, this rate was 11 and 5/8 percent.

The interest rate for business disaster loans for businesses unable to obtain credit elsewhere may not exceed 8 percent; for businesses which have other sources of credit, the rate is the prime interest rate in effect on the day in which the disaster commenced.

b. Economic Injury Loans

The SBA may also make loans to victims to provide working capital and to meet short-term financial obligations that the borrower would have been able to meet if not for the disaster. Only for-profit small businesses are eligible for economic injury assistance. Prior to making these loans, the SBA requires the applicant use personal or business assets, as well as private credit, to the greatest extent feasible. The maximum amount of the loans is $500,000, and the term is not to exceed thirty years at an interest rate not to exceed 8 percent.

6. Pending Disaster Relief Legislation

With the exception of modifications in the interest rates and in the amounts of coverage provided for both agricultural and non-agricultural disaster loans, there have been few changes in disaster assistance laws during the past decade. In the 97th Congress, a bill (S. 2250) proposing several significant amendments to the 1974 act passed the Senate but was not acted upon by the House. In the 98th Congress, the Senate held hearings on an Administration-sponsored bill (S. 1525) that also would make important changes in the disaster relief law, but there has been no further action on it or on a companion measure in the House (H.R. 3430). Because several issues raised during the Hurricane Alicia hearings were directly concerned with proposals in this Administration bill, the main features of S. 1525 and H.R. 3430 are summarized below:

1. Redefines the reasons for a major disaster declaration to include certain natural hazards, any other natural catastrophe, and "any fire, flood or explosion, regardless of cause;"

2. Broadens the meaning of an emergency to include any occasion which the President determines Federal aid is needed "to supplement lives and to protect property, public health and safety, or to lessen or avert the threat of a catastrophe;"

3. Establishes contributions for emergency assistance at 100 percent of cost, but limits contributions for repair or reconstruction of disaster-damaged public or private facilities, and for disaster debris removal, to 75 percent;

4. Disaster grants for flood damage to public or private nonprofit facilities, located in an area identified for at least one year as a flood hazard area, can be made only if those facilities are covered by reasonable and adequate flood insurance;

5. Doubles the amount of matching grants for improving or updating state disaster plans from $25,000 to $50,000 annually for each state;

6. Repeals current authorization for free temporary housing for up to one year for persons displaced by a major

disaster and provides temporary housing only when adequate alternate housing is unavailable and based on the fair market value of the accommodations furnished, adjusted to the "financial ability of the occupant;"

7. Limits payment of disaster unemployment assistance only to those individuals who are not eligible otherwise under regular unemployment insurance programs;

8. Authorizes the President to contribute up to 50 percent of the cost of implementing hazard mitigation projects that are cost effective and would reduce the risk of future damage, hardship or loss; and

9. Authorizes the Attorney General to bring suit against any party whose acts or omissions caused, or contributed to disaster damage for which Federal assistance is provided.

B. SUMMARY OF TESTIMONY ON DAMAGE AND RECOVERY EFFORTS FOLLOWING ALICIA

1. Preparedness, Communications and Evacuation: Effectiveness and Needs

Although some evidence was presented in the hearings which demonstrated improved planning for and readiness to cope with disasters, several witnesses called attention to alleged deficiencies in such matters as emergency preparedness, warning and communications systems, and evacuation procedures in the coastal hurricane region. For instance, Colonel Alan L. Laubscher of the Corps of Engineers, after noting that progress had been made (partly with funding assistance from FEMA) in evaluating the vulnerability of localities and developing emergency plans, stated that there still was a critical need for improved hurricane contingency planning. Testimony submitted by Dr. J. L. Gumnick and Dr. Hugh Stephenson claimed that the most serious shortcoming was the absence of an integrated emergency management system in the Houston-Galveston area. Mayor E. Gus Manuel of Galveston indicated that building codes in his city needed to be strengthened and were being reviewed by a task force. Mrs. Billie Fife, Emergency Preparedness Coordinator for Pasadena, as well as others, recognized the need for improved coordination of warning and communications systems, both among communities and between counties. The Texas Coordinator for Emergency Management, Robert Lansford, cited the necessity for a "good flood plain management program," and City Manager Stephen N. Huffman of Galveston said that an overall evacuation plan was "desperately needed."

Questions were raised also by subcommittee members about the timeliness of Federal aid, the adequacy of intergovernmental communications, the dissemination of weather data and other information, the lack of coordination among local governmental entities, and the effectiveness of plans and decisions for evacuation of people. Chairman Roe wondered whether better advice about lead-time and quicker emergency assistance could be provided by the Federal Government. Representative Andrews expressed concern about whether determinations on evacuation and relocation should be made by local authorities, either alone or in concert, or by an official empowered to make such decisions on a regional basis. He also pointed out an apparent lack of cooperative agreements among communities with respect to pooling of emergency and other heavy equipment for use where most needed after a disaster.

Despite certain negative comments, a number of positive developments emerged during the hearings. State Coordinator Lansford and others described a computer modeling report referred to as SLOSH (Sea-Lake-Overland Surge of Hurricanes, completed in 1981) which can serve as a basis for estimating potential depths of flooding and water surges during severe storms at various elevations in the coastal area. The Baytown coordinator for emergency management, J. Fletcher Hickerson, referred to its usefulness in his city in adopting an evacuation plan and determining whether residents should be relocated from certain sections, if any. Drs. Gumnick and Stephenson said that they have begun efforts toward developing a system of integrated emergency management by planning a gaming exercise based on active simulated hurricane response, and that the Gulf Universities Research Consortium (GURC), (headed by Gumnick) has launched a study assisted by a contract with FEMA to develop a port emergency planning system. Mr. Lansford noted that Texas would soon begin work on a contingency plan for disaster management. He also pointed out that Galveston City, Galveston County and South Harrison County had signed an evacuation plan and that the State of Texas was conducting hurricane workshops and orientation schools to help train local officials in planning for and handling emergencies.

2. Response of FEMA and Other Federal Agencies to Hurricane Alicia

Federal witnesses outlined the measures taken to cope with the emergency and to assist victims suffering losses as a result of the hurricane. FEMA reported that 1,277 damage survey reports had been completed by the time of the hearings and that the estimated cost of Federal aid to local governments alone would total nearly $32 million, $23 million of which would be for debris removal. In addition, more than 16,000 individuals sought help at the disaster service centers established by FEMA. The Corps of Engineers provided personnel to serve as experts on damage survey teams, assisted cities in preparing debris removal contracts, and helped monitor the performance of those contracts. The Small Business Administration (SBA), aided by 56 volunteers loaned without charge by local banking institutions, interviewed over 16,000 victims, and eventually, SBA expected that a total of approximately 7,000 loan applications would be submitted. The Federal Insurance Agency had closed over 1,318 flood insurance cases, 782 of which received final payments. The Environmental Protection Agency participated in damage surveys and took steps to stabilize several toxic waste storage sites to prevent contamination of surrounding areas by overflow during the flooding that occurred.

In general, State and local officials expressed satisfaction with and appreciation for assistance provided after Hurricane Alicia by FEMA and other U.S. agencies. Mayor Kathryn J. Whitmire of Houston, for instance, said that Federal officials worked closely with those from her city, that they were available when needed and were responsive to suggestions, that damage estimates were conducted quickly, and that Houston received some 50 percent of its grant for public damages in little more than a month. City Manager Huffman of Galveston said that FEMA was "very well organized and extremely helpful" and that the Corps of Engineers assisted his staff develop debris clearance bid specifications and contract awards. State Coordinator Lansford praised FEMA for securing a quick Presidential major disaster declaration and for its rapid response in providing help. Judge Jon Lindsay of Harris County, through his representative, Perry Simmons, stated that FEMA personnel began to arrive even before the official major disaster declaration was made and that they worked "very cooperatively" with county officials in supplying survey teams and in recovery efforts. The Mayor Pro-Tem of Deer Park, Harvey Petree, reported in his prepared statement that his city was "very pleased with the initial reaction of FEMA and other agencies" and that their personnel "worked Saturdays and Sundays and late hours in a very professional manner . . ."

Nevertheless, several of those who testified, as well as subcommittee members, offered suggestions (most of them not requiring legislation) which they believed might expedite and improve dispensation of disaster assistance. A few of the more important proposals can be summarized briefly as follows:

1. When a major disaster appears to be imminent, FEMA should have authority to dispatch teams to endangered areas without waiting for a Presidential declaration;

2. Local officials should be consulted more in determining the best locations for disaster assistance centers;

3. Better information and wider publicity should be provided about the types of disaster aid available;

4. A combined application and verification system should be devised in order to speed up processing of disaster victim claims;

5. Local governments should be furnished advance guidelines on debris clearance specifications;

6. Damage survey estimates, especially those for street repair and reconstruction, should take into account differences in costs related to geographical locations and other factors;

7. Advance training should be given those who serve on damage survey teams;

8. Local officials should be provided with technical assistance to enable them to understand better and act more knowledgeably upon hazard mitigation recommendations; and

9. Small Business Administration disaster loan procedures and limits on amounts of loans should be modified.

Various official responses were offered to some of these suggestions as well as to other points. After emphasizing that FEMA already has a number of preparedness programs, Joseph Winkle, Assistant Associate Director for Disaster Programs of that agency, said that he believed it is better for properly prepared State and local personnel to deal with early stages of emergencies than for Federal staff to be sent in "when the wind is blowing and the life-saving activities would be taking priority." In his opinion, FEMA's role should be that of providing preparedness programs which enable State and local governments to train a sufficient number of their own employees to handle emergencies rather than to rely on direct Federal participation or management. Winkle also noted that attempts by FEMA at early identification of suitable locations and facilities to be used as future disaster assistance centers had not been worthwhile, especially in more vulnerable areas, because places selected might be damaged or destroyed and be unavailable for that purpose.

The Corps of Engineers representative, Mr. Laubscher, explained that his organization is authorized by Army regulations to take immediate action during certain emergencies to save lives, prevent suffering, or mitigate damages, but it was not requested to do so during Alicia. While the Corps had a limited part before the hurricane struck, it did notify contractors of the impending danger and later implemented its standard hurricane procedures. George Darby, of the SBA, stated that his agency met with private banking institutions in the area and requested them to make interim loans to damaged businesses. He estimated that about 34 percent of all SBA disaster loan applications were rejected because of lack of repayment ability; those turned down were referred to the family grant program for assistance. Dick Whittington, Regional Administrator of the Environmental Protection Agency (EPA), after listing five types of activities it was authorized to perform after Hurricane Alicia, agreed with Chairman Roe that a top national policy priority for EPA should be the stabilization of dangerous toxic wastes after a major disaster. State Coordinator Lansford reminded the subcommittee that disaster assistance centers are intended primarily to be facilities where victims can apply for different kinds of aid but can receive immediate help only from the Red Cross. He also said that, while the State of Texas tries to help local authorities determine the best locations for disaster centers, pre-selection of such sites is not practicable. He claimed that his office had an intense public information program designed to reach all people in threatened areas through television, radio, newspapers and other communications means.

3. Adequacy of Emergency Aid Funds for Local Communities

Although considerable criticism was directed (as will be noted later) at the 75 percent limit imposed on Federal contributions to help restore damaged public facilities, few comments were made during the hearing about the adequacy of funding for immediate emergency purposes. City Manager Huffman of Galveston believed the Park Board of his city should be reimbursed, at least under the 75 percent formula, for use of the Civic Center Auditorium as a disaster relief center, especially because of added expenses for a special generator supplied when electric power failed. He also thought that estimates of cost for repairing damaged city streets were too low and did not reflect variations in areas and local conditions. The possible need for furnishing dry ice for refrigeration purposes to householders suffering long periods of electric power outages during a major disaster or emergency was also discussed. Suggestions were made that the $25,000 annual grant to States for preparedness planning ought to be at least doubled. Some concern was expressed about the steps which EPA should take to mitigate potential problems posed by storage of toxic wastes in flood prone areas. Mr. Huffman and Mayor Allen Cannon of Baytown also proposed that minor projects (under $25,000) should be reimbursed by a direct grant without following current requirements for damage survey reports, supporting documents and auditing prodecures. With respect to the latter proposal, however, it should be noted that the Disaster Relief Act of 1974 currently authorizes the President (section 419) to make an in-lieu contribution based on 100 percent of the total cost of repairing or restoring destroyed public facilities and for debris clearance, if the total needed for those purposes is less than $25,000.

4. Debris Clearance Problems and Contracts

Massive accumulations of debris caused by flooding from Hurricane Alicia affected nearly all local jurisdictions in the coastal area and accounted for a large proportion of Federal aid funds for public purposes. Despite sizable tasks faced in removing and disposing of rubble, most witnesses reported the job had been accomplished quite expeditiously, set forth few complaints, and advocated a minimum number of changes. A charge made more than once, however, was that FEMA had not provided adequate guidelines in advance for local officials to follow in awarding debris clearance contracts. In addition, Mayor Whitmire of Houston said that her city could have used help the first weekend in preparing debris clearance specifications and that some problems had been encountered with respect to whether certain specifications would or would not be acceptable to FEMA. Mayor Cannon of Baytown objected to FEMA's refusal to agree that slabs remaining under some 300 demolished homes constituted debris under official regulations and to share in the cost of their removal at approximately $1,000 each. Mayor Wilbur O. Wetzel, Jr., of Kemah believed that small cities such as his should be asked to contribute only 10 percent of the cost for debris cleanup. Chairman Roe stressed that debris removal was important for a number of reasons other than for aesthetic purposes; streets must be cleared quickly so that police, fire and other emergency vehicles can move without obstacles, communications and electric power can be restored as soon as possible, and persons who must relocate can be evacuated with little delay.

5. Corps of Engineers Projects and Contingency Activities Related to Alicia

Colonel Alan L. Laubscher, The Corps of Engineers District Engineer in Galveston, estimated that the tidal flooding damages from Hurricane Alicia were $123 million, while stream flooding damages amounted to $27 million. Colonel Laubscher also enumerated both the Corps' hurricane and flood long-term preventative protection projects and studies, as well as short-term emergency hurricane efforts related to hurricane Alicia.

a. Long-term Projects

According to Colonel Laubscher, one of the most important Corps flood control projects for the area is the Galveston Seawall, for which construction began in 1902. The Corps has estimated that the Seawall prevented about $100 million in damages.

Dr. Neil L. Frank, Director of the National Hurricane Center of the National Weather Service, attested to the importance of the Galveston Seawall, stating that, "The saving grace in Galveston was a 15-foot seawall designed to protect against a moderately strong hurricane."

Dr. Frank stated that Alicia had been a weak storm offshore, in the final hours before reaching the coastline it had strengthened and arrived "much stronger than we had anticipated." Had Alicia strengthened still further to a severe hurricane before landfall, and had it produced a storm with a 15-20 foot surge, which would have topped the seawall, the damage and loss of life would have been "catastrophic." He questioned the advisability of building condominiums on the seaward side of the seawall on the east end of Galveston.

Finally, Dr. Frank pointed out that in other high risk areas, such as the New Jersey coast, the south coast of Long Island, the Outer Banks, and the west coast of Florida, there are no seawalls.

Colonel Laubscher described three other flood control projects, located along the Texas coast at Port Arthur, Texas City, and Freeport, which protect a coastal area of 140 square miles. The Corps estimated that the completed hurricane protection projects at Texas City and Freeport prevented $16 million in damages. Other projects which provided protection for the area were the Addicks and Barker reservoirs, flood control detention reservoirs which provided some protection for Houston; the Brays and White Oaks Bayous, concrete-lined flood control channels in Houston; and Vince Bayou in Pasadena.

Colonel Laubscher described proposed Corps projects which would protect the Texas coast from high tides associated with hurricanes, but it is unable to develop any further because local governments were unable to provide required support. A 1977 study identified a number of such projects, but local sponsors could not finance the 30 percent local share. The Corps currently has a variety of hurricane-related studies in the Texas region. One is a flood control study addressing the impact in Houston of hurricane-induced heavy rains. Another is a beach restoration study for the Texas Gulf coast. The present draft of this study indicates that several projects near Galveston and Freeport may be economically justified. Again, however, the capability and willingness of the local communities to meet local cooperation requirements is a matter to be resolved.

Finally, Colonel Laubscher described the hurricane contingency planning in which the Corps was involved. The Federal Emergency Management Agency (FEMA), through its Disaster Preparedness Assistance Program, initiated the program in 1982. The program consists of grants to evaluate an area's vulnerability and develop contingency plans. Texas is one of the eligible States under this program.

b. Contingency Activities

Colonel Laubscher indicated that the Corps had a "limited role in the protection of the populace immediately before a hurricane hits and during the actual storm." Prior to the hurricane, the Corps District safeguarded its equipment, notified its contractors of the impending event, contacted local sponsors of projects to assure proper operation of hurricane protection projects, notified FEMA of these efforts, and established the hurricane emergency operations center.

He stated that, during the emergency event, the Corps is authorized under Army Regulation 500-60 to take immediate action, as long as such actions involve only Government personnel (and not contractors). No one, however, requested the Corps' assistance under this authority. Immediately after the hurricane struck, the Galveston District carried out its standard damage survey procedures.

Regarding the Corps' role in survey of the hurricane damage, Harris County Judge Jon Lindsay indicated that the Corps of Engineers provided "great assistance" to the county. Mr. Stephen N. Huffman, Galveston's City Manager, suggested that FEMA could hold training for all the Federal agencies involved in this effort. An alleged agency shortcoming that this training could improve is knowledge of mitigation measures which could be proposed as eligible work to restore the area to pre-disaster conditions. According to Mr. Huffman, 15 percent of eligible work could be mitigation measures, such as flood proofing.

Huffman testified that, while the Corps provided some assistance to his staff in the development of debris clearance bid specifications, they did not provide this assistance as quickly as had been hoped, thereby causing "some delay." He suggested that the process could be expedited if FEMA could provide bid specification guidelines in advance.

6. Potential Problem from Barges at the Bridge

A potentially dangerous situation developed during Alicia at the bridge over the San Jacinto River on route I-10 which could have led to a catastrophe. This major evacuation route for Baytown and the East Harris County communities could have been blocked if two unanchored barges had knocked out the bridge.

Both Mayor Cannon of Baytown and Perry Simmons, representing Harris County, Judge Jon Lindsay, presented testimony on this potentially dangerous situation. Mayor Cannon suggested that regulations were needed for insuring proper barge anchorage and storage on the San Jacinto River near the bridge. Mr. Simmons suggested that the Coast Guard should develop a contingency plan to move these vessels in an emergency.

Representative Roe mentioned that a barge anchorage project may be considered in the water resources authorization legislation before Congress. Representative Roe also mentioned an amendment to this legislation to give the Corps of Engineers the authority to continue its emergency activities while FEMA coordinates its disaster relief program.

7. The National Flood Insurance Program and Hurricane Alicia

Representative Roe asked Mr. Donald Collins, Assistant Administrator of FEMA's Federal Insurance Administration, whether he thought there was a falloff in the citizens participating in the National Flood Insurance Program (NFIP).

Mr. Collins responded that he did "not see any significant drop in policy count." He pointed out, however, that there had been a falloff of about

6,000 one-year policies between 1981 and 1982--from 1,864,000 policies in 1981 to 1,858,000 policies in 1982. This falloff was due in "part" to a changeover from a one-year to a three-year policy. Many of the policies which switched to the three-year schedule were not counted in the 1982 tallies. The rest could be accounted for by "fluctuations each year." At the time of the hearing, there were just under 1.9 million policies. 17,000 communities now participate in the flood insurance program nationwide, and almost 800 in Texas.

Mr. Collins added that so far in the aftermath of hurricane Alicia, the Flood Insurance Administration at FEMA had processed 1,318 individual flood insurance claims. Payments were made in 782 of these cases, of which 70 were partial payments. The average amount of paid claims was about $4,300. Of the 536 cases closed without payment, some were closed because the claim was under the deductible amount, while others were closed because the losses were wind-related and, therefore, not covered by the NFIP.

Mr. Robert A. Lansford, State Coordinator for the Division of Emergency Management, Texas Department of Public Safety, pointed out that the State of Texas was providing supplementary assistance to the NFIP. He estimated the State was providing one-third of flood insurance relief benefits.

Mr. Joseph Winkle, Assistant Associate Director for Disaster Programs at FEMA, emphasized the coordination principles in the NFIP, pointing out the important role of Mr. Lansford's office in this effort. "The underlying principle here is that the State government supplements the local efforts and the Federal Government supplements the State and local efforts."

Dr. Neil L. Frank, Director of the National Hurricane Center, testified that barrier island development should not create a "deathtrap." Barrier island development should take hurricane risk into consideration. Specifically, this development should be limited by the people that can be evacuated in the warning lead time the National Weather Service can provide.

Mayor E. Gus Manuel of Galveston agreed that barrier islands should not be developed to the point of creating a deathtrap, and felt that Galveston had been overdeveloped. Mayor Manuel also indicated that some of the building in Galveston may not have been constructed in a manner consistent with the needs of the area. Pointing out that many of the roofs attached with staple guns had blown off during the hurricane, he recommended that the use of staple guns should be eliminated.

8. The Small Business Administration and Hurricane Alicia

Mr. George L. Darby, Director of the Disaster 3 Area of the Small Business Administration (SBA) outlined the role SBA had played in the aftermath of the disaster. Although the agency expected to interview a total of about 17,000 disaster victims, at the time of the hearing it had interviewed 16,500: 13,800 of these were individuals, homeowners, and tenants; the other 2,600 were businesses. Although it expected to receive a total of about 7,000 applications, at the time of the hearing SBA had received 1,327 applications for individual assistance, and 240 applications for business assistance. SBA had verified the losses for 817 homes and 201 businesses, and processed 170 loans for approximately $1.5 million. The average time for verification was four days, and the average time for processing was 11 and 1/2 days.

Mr. Darby explained that, shortly after SBA representatives had opened an assistance center in Galveston, they held meetings with every leading financial institution in the area. The purpose of these meeting was to inform the institutions of the SBA program, and to seek their help in processing loans in order to provide assistance to the businesses of the community as quickly

Representative Tom Vandergriff of Texas complimented Mr. Winkle on the performance of the SBA in the aftermath of Hurricane Alicia. "I am familiar with the fact that your agency has performed to such an extent that Congressman Andrews' staff tells me that they have had absolutely no complaints about your services to date." Representative Vandergriff also questioned Mr. Winkle on whether he supported a congressional initiative contained in H.R. 3020 (98th Congress) to remove the administrative limit setting authority on disaster loans (currently at $55,000), or at least adjust it upwards to a more realistic figure. Mr. Winkle responded that in the area affected by Hurricane Alicia, generally this limit had been satisfactory. He added, however, that current maximum loans might not be adequate for certain types of disaster impact in certain areas. He cited mudslides in Southern California as an example of where the $55,000 loan limit would have been insufficient in many claims cases.

9. Proposed Changes in Disaster Relief Legislation and Regulations

During the hearings, a number of proposals were offered which would require changes in basic disaster relief legislation, regulations, or policies. One of the most frequent suggestions was that the amount of Federal contributions to State and local governments for debris clearance and for the repair or reconstruction of damaged facilities should be increased. The significance of this request can be understood best if it is recalled that no specific amounts for these purposes were stipulated by either the Disaster Relief Act of 1974 (P.L. 93-288) or by its predecessor act of 1970 (P.L. 91-606). To the contrary, they authorized the President without fixed limits either to use Federal agencies or to make grants to State and local governments for the removal of debris and wreckage caused by a major disaster. Likewise, they authorized the

President to make grants for damaged public facilities (and, in the 1974 act, for certain private, non-profit facilities) with only the restriction that the amounts could "not exceed 100 percent of the net cost" for their repair. Official policy established under these provisions for a decade fixed the level of Federal payment for both purposes at 100 percent of all eligible costs, but since the Mount Saint Helens volcano eruption in May 1980, the United States contribution has been reduced to 75 percent. Although bills were introduced in the last two Congresses to incorporate this restriction in the statute, none has been enacted yet into law.

Local situations or special conditions were often cited as reasons for justifying a need for increased Federal contributions. For instance, Galveston Manager Huffman said that, in cities with sizable amounts of property exempt from taxation, the committee should consider the advisability of raising the Federal portion to as much as 95 percent. Mayor Wetzel of Kemah, a city with less than 5,000 people and with only 4 businesses out of 30 left operating, thought that small cities should be asked to pay no more than 10 percent rather than 25 percent as their share for debris clearance and for repair of streets and other public facilities. Mayor Whitmire of Houston endorsed the concept of a 95 percent Federal contribution, proposing that in determining the payment schedule there should be an overall evaluation of the effect of a disaster on a particular locality, taking into account other disasters occurring in the area for which no payment had been made. Chairman Roe suggested that perhaps the law should be amended to provide for a credit offset on local payments for the services rendered in kind by a community, presumably for such items as furnishing a building or equipment used by Federal agencies. As noted previously, some witnesses advocated an outright Federal grant without restrictions or auditing for projects in which the damages totaled $25,000 or less.

A number of provisions in an Administration sponsored bill (H.R. 3430, S. 1525) to amend the Disaster Relief Act of 1974, as well as other proposed statutory amendments, were commented on during the hearings. The most comprehensive review and analysis of such damages was presented by the National Director of Disaster Services for the American Red Cross, Mr. Robert Vessey. His recommendations are summarized below for convenient reference purposes according to the order of the relevant sections in the 1974 law rather than the order in which they were discussed:

1. Section 102. Expand the definitions of both "emergency" and "major disaster" to include nuclear accidents and chemical spills;
2. Section 303. Authorize the President to appoint a Federal coordinating officer before an emergency or a major disaster is declared to facilitate advance coordination of preparedness activities;
3. Section 306. (403 and 503 in H.R. 3430). Expand the current authority of the American Red Cross to distribute food, medicine and other government supplies so that it also could implement, on a reimbursable basis, "parts of the Individual Family Grant, Temporary Housing, and other programs;"
4. Title III (new section 315 in H.R. 3430). Authorize the Attorney General to begin court action to recover U.S. funds expended in an emergency or major disaster from any party whose acts or omissions may have caused or contributed to the damage for which Federal assistance was provided;
5. Section 402 (b). Provide 100 percent Federal funding for the repair or reconstruction of private nonprofit educational, utility, emergency, medical and custodial care facilities which are damaged or destroyed in a major disaster;
6. Section 404. Amend a change proposed by H.R. 3430 (section 14) which would eliminate the present statutory provision for 12 months of free rental in temporary housing for disaster victims, so as to require that determination of an occupant's ability to pay rental would be based upon his post-disaster rather than his predisaster financial situation;
7. Section 406. Retain the new provision in H.R. 3430 (section 15) which would authorize the President to contribute up to 50

percent of the cost of implementing hazard mitigation projects he determines to be cost effective and which would substantially reduce future risks;

8. Section 407 (a). Consider amending the proposal in H.R. 3430 (section 16), which would limit unemployment assistance for disaster victims to those who are "not otherwise eligible for payment of unemployment compensation" from any other Federal or state program, because such a restriction might result in fiscal hardship for States with depleted unemployment funds;

9. Section 408 (a). Authorize (as noted before) the American Red Cross to implement the individual and family grant program, at least in part because, in his opinion present administration by the States has resulted in "fifty different programs that varied in their timeliness and effectiveness," delays in implementation, much frustation, and additional costs to private voluntary disaster assistance organizations;

10. Section 408 (b). Because of increased costs during the last decade, increase the amount any individual or family could receive from the individual and family grant program after any one major disaster from a maximum of $5,000 to at least $7,500; and

11. Section 408 (b). Reimburse States for 50 percent of their administrative costs which are in excess of the present limit of 3 percent of the amount of the grant made to a State under the individual and family grant program.

HURRICANE ALICIA—PREDICTION, DAMAGE, AND RECOVERY EFFORTS

FRIDAY, SEPTEMBER 23, 1983

House of Representatives,
Committee on Science and Technology,
Subcommittee on Natural Resources, Agriculture
Research and Environment,
Houston, Tex.

The subcommittee met, pursuant to call, at 9:30 a.m., in Courtroom No. 2, Federal Building, 515 Rusk Avenue, Houston, Tex., Hon. James H. Scheuer (chairman of the subcommittee) presiding.

Present: Representatives Scheuer and Andrews.

Staff present: George S. Kopp, staff director; Robert Palmer, science consultant; Mary Beth McJury, minority technical consultant.

Mr. Scheuer. The Subcommittee on Natural Resources, Agricultural Research and Environment will come to order.

This committee has convened a number of these hearings on issues related to public weather services in various parts of the country. And these hearings have been underscored by the recent passage through your community of Hurricane Alicia. In fact, today's hearings is the 10th which the subcommittee has held on the present and future needs of the associated weather, public weather services in our country.

We know from our previous hearings that the National Weather Service in this country is stretched to the breaking point. Funding has not kept up with inflation and the Weather Service personnel levels have actually decreased by over 300 positions since 1970. These reductions are particularly painful when one realizes that satellite technology and radar capability and computing power are all available now, right off the shelf, with the potential for revolutionizing the effectiveness of weather forecasting in this country.

Against this backdrop the administration in Washington has advanced a number of proposals which would result in radical changes in the operations of the National Weather Service. They have proposed selling the Nation's four weather satellites to the private sector, the so-called commercialization or privatization proposals. They have proposed to contract out large portions of the National Weather Service to the lowest bidder. They propose to close many local weather stations and to eliminate many traditional services such as agricultural weather services, frost warnings and the like.

Our subcommittee, which has the responsibility for the budget of the National Weather Service, has heard voluminous testimony over the past year on the merits and demerits of these various proposals. Your Congressman, Mike Andrews, who is one of the most thoughtful and the most respected of the junior Congressmen in Washington, has played a diligent and creative role throughout these debates. And we are particularly delighted to have him here today, and to benefit from his familiarity with all of the many complicating factors surrounding Hurricane Alicia.

In fact, on Monday of this week, Mike was the prime sponsor in the House of Representatives of a concurrent resolution proposing to stop with what is an emerging consensus in the House this ridiculous proposal to auction off the $1.6 billion weather satellite system to the lowest bidder.

Today we will continue our oversight of the National Weather Service by examining how these services operated in response to Hurricane Alicia. Specifically we would like to evaluate methods recently developed by the Weather Service to rate the intensity and landfall probability of hurricanes like Hurricane Alicia. We will examine the source and adequacy of the weather information utilized by officials here in Texas at the Federal, State, and local level in their planning for coastal evacuation and other emergency measures. And we hope to examine the role of local weather stations and weather officials during the passage of Alicia with a view to assessing what might have happened had these local stations been contracted out to private sector operators.

As terrible a tragedy as Hurricane Alicia was, I would like to think that it may lead to some small and lasting benefits—that by thoughtful analysis, introspection, in meetings like today, we can continue to improve our understanding of the phenomenon of hurricanes and improve and upgrade essential public services like those provided by the National Weather Service.

At this time I would like to hear from Congressman Andrews and turn the chair over to him for further deliberation and further testimony on the implications, the many implications and lessons to be drawn from our national experience and the local experience that you have derived through Hurricane Alicia.

Mr. ANDREWS. Thank you, Mr. Chairman. It is a real pleasure and an honor to have the chairman of our very important Subcommittee on Science and Technology here in Houston from New York today in his first trip to our city.

Hurricane Alicia has provided this subcommittee, though tragically, with an opportunity to review at close range our weather service operation and how it serves local communities in times of severe weather conditions.

A close review of the system we have in place and how well it works is particularly valuable now since fundamental changes to its current structure are being contemplated.

This subcommittee has spent a good deal of time and effort in recent months studying the implications of the Reagan administration's proposed consolidation of NWS operations and sale of our Nation's weather satellites.

Advanced in the name of cost-effectiveness, I believe it is fair to say that these initiatives are ill-conceived and could have disastrous consequences from both a budgetary and public safety standpoint.

I am hopeful that the resolution that I have introduced on Monday, which expresses congressional opposition to the sale of our weather satellites, passes quickly, before the administration's plan has any further time to mature.

But there are a good many other questions to be explored today as well, issues which our recent experience with Alicia has cast in sharp relief.

The National Weather Service, for example, has developed a new system of rating hurricanes: Hurricane Alicia was the system's first test. We ranked Hurricane Alicia at a certain level and then very quickly it accelerated to a higher level right before it hit land. We want to look closely at how it performed under pressure, its advantages, and how it continues. We also want to look at how critical weather information is communicated to local officials. Tomorrow Mayor Whitmyer is expected to testify, how weather information is communicated to the media, and to the public, the adequacy of that information and how it is interpreted and then disseminated for mass consumption.

We want to look closely at the role of local officials in weather emergencies and the decisionmaking process in ordering, or not ordering, an evacuation. And if an evacuation is not a realistic option, how can we work together more effectively to protect the public from devastation of life and property that we came so close to in this last hurricane.

We have a lot to discuss this morning and to learn today, and I would suggest we move forward with our concerns. I think one comment the chairman made is very important. This is one of a series of hearings our committee is having literally around the country in discussion of these broad-ranging issues to determine what kind of national policy changes should be made, what new policy initiatives should be evolved as we face future hurricanes and national disasters of this kind.

So without further comment today our first panel is composed of Dr. Neil Frank. Dr. Frank is the director of the renowned National Hurricane Center in Miami and will be testifying first today.

Dr. Frank, I want to welcome you to Houston. I appreciate your coming and being here.

And also Mr. Steve Harned of the National Weather Service is here today.

Dr. Frank, if you will please go first and either read or summarize your statement which we all have and certainly made available to the media.

Before we begin I might add we hope to finish this hearing sometime this morning before we break for lunch. That is sort of our timetable depending on the testimony.

So, Dr. Frank, welcome to the committee. Please go ahead.

STATEMENTS OF NEIL L. FRANK, PH.D., DIRECTOR, NATIONAL HURRICANE CENTER, NATIONAL WEATHER SERVICE; STEVEN HARNED, METEOROLOGIST IN CHARGE, HOUSTON AREA WEATHER SERVICE OFFICE

Dr. **Frank**. Mr. Chairman, I appreciate the opportunity of coming over and sharing my concern for the hurricane problem.

Hurricane Alicia was almost the nightmare we have come to fear in meteorology. That is, we have a weak storm approaching the coast line. We initiate the proper action to protect life in the community on the basis it is a weak storm. Then in the final hours before landfall, the storm strengthens quite rapidly and arrives much stronger than we had anticipated. Then we don't have enough time, see, to go back and readjust our plans and get those people that are now exposed back to a safe place.

But the saving grace in Galveston is that there is a 15-foot sea wall. That sea wall was designed to give protection against a weak or moderate hurricane. It did a very effective job of doing that as Hurricane Alicia came on into the coastline here. But we don't have sea walls on the Jersey coast, and we don't have sea walls on the south coast of Long Island, and we don't have sea walls on the Outer Banks or west coast of Florida. For example, the Tampa Bay area where we have 100,000 people or more living on those outer islands, if we had had Hurricane Alicia there I am sure we would have had a greater loss of life.

I want to make one very positive point today. I am extremely impressed from my perspective of the way the community responded. I believe that is because they had good plans in effect. I also believe those good plans were the result of a very effective, comprehensive evacuation study that was completed in this community just 1 year ago.

Now, what do I mean by comprehensive evacuation study? I mean that you have got to consider your neighbors when you are developing your comprehensive plan for evacuation. The people down at Galveston say, "Well, we are going to put everyone on I–45 and take them north." But Texas City is also going to use I–45, and a lot of the other communities along I–45. So you cannot just isolate your problem from your neighbors' comprehensive evacuation plans.

There was one that was completed in this community a year ago, and the plans then have reflected partly that study. I would want to stress that I believe that that study is one of the finest examples of a cooperative program you can have from the Federal, the State, and local level. FEMA provided some funds for the State. The State matched some of those funds and hired, gave a contract to Texas A&M, who came into the local community then and worked with local officials to develop the plan.

Mr. **Scheuer**. Could you tell for the record, spell out FEMA?

Dr. **Frank**. Federal Emergency Management Agency—yes, sir. And because of that plan that involved the local government officials, then, it worked, we had a working situation in Hurricane Alicia that was very effective. I want to emphasize that that would not have been effective had it not been for the tremendous cooperation we have between our local weather service offices here in Galveston and Houston and the local weather officials.

Part of that plan, part of that study involved identification of those areas that could be flooded. So my agency, National Oceanic Atmosphere Administration [NOAA], has an excellent numerical model of the storm surge that was run for a whole scenario of hurricanes and helped identify the areas around Galveston Bay that could be flooded. Then Steve and Mr. Bloom down at Galveston, and Mr. Harned's predecessor, Mr. Palmer, all worked very closely with the local government as they developed the plans on what they would do in case of a hurricane.

And because of those plans and because of the weather service's involvement in development of those plans, then when Alicia began to strengthen he could make the right contacts with local governments because he knew what the plans called for. And so they were able to adjust the plans in the late evening and undoubtedly saved hundreds of lives. OK, that was the good thing.

I believe that that is because local weather service offices are involved in local government plans. That is what made it so effective. But I want to just touch briefly on four concerns that I have.

The first concern, of course, is that we need to have backup plans that we can implement when we have the meteorological surprises. Now, what if Hurricane Alicia had been a moderately strong storm and strengthened to a severe one? What would have happened? Fifteen to twenty feet of sea water would have crested the wall there and filled the basement of the Galveston Hotel where I understand a lot of people had gone to at the height of the storm. There would have been a major disaster there.

We need to have backup plans. It is all right for the primary plan to call for complete evaluation but, boy, when you talk about 36 hours to complete that evacuation, I may not always be able to give that. As a matter of fact, in recent years we have tried to provide 12 hours of leadtime for evacuation purposes. We now know that that just isn't adequate. So we need to have backup plans.

Now, what can we do if several thousand people get trapped on Galveston Island? You don't have enough time to get them off. Well, there are not many alternatives. One thing we have suggested is that maybe you could go up in the multistory buildings back away from the waterfront. We call this vertical evacuation. Maybe that would be a valid backup plan we could implement, then, in case we have a meteorological surprise.

The second thing I would stress is that we need to improve our ability to forecast hurricanes a lot more than we are able to today. We have had tremendous improvements in our ability to observe the hurricane. Satellites, every 30 minutes I get a new picture, day and night. Reconnaissance airplanes and the radar, and there is kind of a myth going through the land because you have had such tremendous improvement in your observing ability that means that you are forecasting better. No, that isn't necessarily true. And we are not keeping pace with the pressure that is being brought to bear upon us by this increasing coastal population. Over the last 10 or 15 years there has been a gradual erosion of the amount of dollars that we are spending for hurricane research in this Nation.

The third point I would like to emphasize is the question that deals with how we are developing the coastal islands. Look, I am not negative about living on barrier islands. I am very positive about that, and you have some beautiful barrier islands here in Texas, and it is a great way of life. So I am not negative about developing those islands.

But what I am negative about is building deathtraps. By that I mean we get more people on the islands than we can get off with the realistic leadtime that I can provide in a hurricane warning on the existing roadway systems. I am not too sure it is wise to build condominiums ahead of the seawall on the east end of Galveston Island.

The fourth point I would like to make is that I am greatly concerned that some day we are going to have a meteorological disaster and part of the reason for that disaster will be the confusion caused by multiple sources of meteorological opinions being broadcast into the community. Behavioral scientists tell us if you want to maximize response you want to minimize confusion. When you have several different meteorological opinions that are being broadcast into a community, then that causes confusion and that, furthermore, causes delay in the decision-making.

They also tell us that if you have a choice of several opinions, we have a tendency to accept that opinion which minimizes our danger. We are optimistic by nature. So we are looking for that opinion that would essentially deny that we are going to have an impact. So if we have several opinions being broadcast and one of them says, "Well, the hurricane is probably going to miss," then that is the one that many of us would decide to adopt because that is the one that says that we are not going to get hit.

Now, even in this storm Hurricane Alicia I think it was interesting that apparently there was some confusion caused by some broadcasts that were stating it was going to Freeport. Now, the eye did go that direction. But one of the things that I have observed over the past 25 years, in every landfall of a hurricane there has always been confusion about the eye. People tend to think that that point is the storm and if it goes over my house, then I am going to have an impact; if it goes to Freeport, then I am OK. And I had a number of reporters ask me after the storm, "Hey, we talked with people in Galveston and they decided not to evacuate because they were hearing that it was going to Freeport." Well, the eye did go over around Freeport. But a hurricane is not just a point; it has size and dimension. So the main part of the hurricane hit Galveston Island.

I think that confusion, see, is an example of the kinds of things that I am saying when you have multiple sources of meteorological opinion that go into the community. Now, we are more vulnerable to the hurricane than we have ever been in the United States, primarily because we have a lot of people located along the coast line.

I would like to give you this series of pictures if I may that show what has happened in some of the communities where we have had a bad hurricane. In 1979, we had a hurricane by the name of Frederic that moved over the Alabama coast. Gulf Shores, Ala., was one place that was devastated. We have a series of pictures that show before the storm, the building after the storm, the rebuild, then, in 1982. And I think you can see from these pictures that we have got a lot more people in Gulf Shores now, in 1982 or 1983, than we did before the storms.

There was not one multistory condominium along that coast line before the storm. There are now nine, and many more have been built.

Mr. Andrews. Why don't you go through those, Dr. Frank, very quickly? And with the chairman's permission we can attach these to the record as exhibits to the testimony.

Dr. **FRANK**. If you would like further copies, I will be sure you get those, too. But we have a beach house and condominium, a three-story condominium. Incidentally, that was on pilings, just like many of the buildings down on Galveston Island. That is required by the Federal flood insurance program. So there was ground-floor parking. Twelve feet of storm surge came by and destroyed both wings of that particular building.

Then we have rebuilt—1982. Then we had a series of winter storms this last year. Each of them had winds and waves with them. It essentially has destroyed the sea wall. So in 1983 we still have the same units there but the sea wall is destroyed. As a matter of fact, you can see some of the wing units have already been undermined completely.

Mr. **ANDREWS**. Why don't you go back a little bit and show us the before and after of that?

Dr. **FRANK**. This was the before. Then we have the after scene here; both wings of that particular condominium were totally destroyed. I had a friend who was part owner of that second unit here on the left. But he was one of the lucky ones, because he sold out his interest to his sister-in-law the winter before the storm. He called me up afterward and I said, "Is your sister-in-law still speaking to you?" He says, "You'll never guess what she's trying to do." He says, "She wants to buy the wing unit when they rebuild." And that is exactly what she has done. She now owns the wing unit on that particular building. And she told my friend that the insurance is not going to cover the damages that she has experienced now as a result of this winter storm.

Then you have another motel, one wing parallel to the beach, two-story wing on the west and one-story wing on the right. The only thing that was left after the storm was the one-story wing on the right. It has been rebuilt. It is now a four-story building.

You have the Tiki Restaurant. You see the dark building here with the palm trees around the parking lot.

Mr. **ANDREWS**. Where is that restaurant?

Dr. **FRANK**. It is at Gulf Shores again. All these pictures were taken from Gulf Shores. Now, Gulf Shores is a little island on the east side of Mobile Bay. All right.

Then you see after the storm the only thing that was left was the palm trees. Now, I don't know whether the owner of this restaurant took advantage, or learned his lesson or took advantage of the increase in land prices there, but either way he sold out his interest to a condominium developer who has now placed this condominium there.

This shows the magnitude of the problem here. We were able to get the people out of Gulf Shores as Frederic was approaching, because there were only 1,500–2,000 people. I don't know whether we are going to be able to get them out with the next storm approaching, because now there are thousands of people out there.

I appreciate the opportunity of sharing with you a little bit today.

[The prepared statement of Dr. Frank follows:]

STATEMENT BY
DR. NEIL L. FRANK
DIRECTOR, NATIONAL HURRICANE CENTER
NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

BEFORE THE
SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH
AND ENVIRONMENT
COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

SEPTEMBER 23, 1983

Mr. Chairman and Members of the Subcommittee:

I appreciate this opportunity to participate in the Subcommittee's study of the prediction and aftermath of Hurricane Alicia.

Alicia was almost the nightmare that we have come to fear. A weak hurricane approaches a coatal community, appropriate action is taken to minimize loss of life, and then in the final hours before landfall, it intensifies and there is not enough time to complete the additional action required. The saving grace in Galveston was a 15-foot seawall designed to protect against a moderately strong hurricane.

But what if Alicia had been a moderately strong storm and strengthened to a severe hurricane before landfall? How many could have died in the Galves Hotel if a storm surge 15-20 feet high had topped the seawall and flooded the basement? The resulting loss of life and damage would have been catastrophic.

Tropical Storm Alicia formed in an area of disturbed weather over the northern Gulf of Mexico on Monday, August 15, 1983, and drifted slowly westward. It became a minimal hurricane (category 1) on Tuesday, August 16, and gradually intensified to a moderate hurricane (category 3) before crossing the upper Texas coast in the predawn hours of Thursday, August 18.

Before proceeding, let me give a short explanation of the classification system we have been using for several years to rank hurricanes. This system was developed by Saffir, a structural engineer, and Simpson, my predecessor; thus, the Saffir/Simpson scale. It is a relative scale ranging in value from 1 to 5; 1 is a minimal hurricane and 5 is the strongest hurricane you would ever expect to experience. In the context of today's building codes, structural damage usually begins when winds exceed 100 mph; therefore, we arbitrarily define a major hurricane as a 3,4, or 5, i.e., one in which the winds exceed 110 mph. For reference, the 1900 hurricane that claimed 6,000 lives on Galveston Island was a strong 4.

We have found this scale extremely useful in placing past hurricanes in proper perspective. Behavior scientists tell us that people have a tendency to exaggerate, and this is certainly true about hurricanes. Many surveys show that most coastal residents believe they have experienced a bad hurricane, when in actual fact they have not.

The strengthening of Alicia from a category 1 to a category 3 took place in the final 18 hours before the eye moved across the extreme western part of Galveston Island. This unexpected event required considerable last minute adjustments to preparedness actions late Wednesday evening. I was extremely impressed by the ease with which these adjustments were initiated. This would not have been possible if the appropriate plans had not been developed in advance, and it is important to note that they resulted from a dedicated commitment on the part of local, state and Federal agencies.

Over the past several years, considerable attention has been given to the hurricane problem in Texas. The Department of Public Safety, the Texas Marine Council, several academic institutions such as Texas A&M and St. Thomas University, local emergency management officials and representatives from several Federal agencies, such as the Federal Emergency Management Agency (FEMA) and the National Weather Service, have worked closely to emphasize the hurricane problem in Texas. This fine cooperative effort between local, state and Federal officials resulted in an outstanding five-stage evacuation study for Galveston Bay, completed last year.

1. Identify the areas vulnerable to flooding by hurricane. This was accomplished by a numerical model of the storm-surge phenomenon developed by NOAA. The model was run by NOAA for approximately 150 different hurricane scenarios and flood zones were determined for weak, moderate and strong hurricanes.

2. Determine the number of people who live in the flood zones -- FEMA provided some of the funds to the State, which contracted with Texas A&M to do the study. Census figures were used to determine the populations vulnerable to flooding.

3. Evaluate the expected behavior of the people at risk -- this step is extremely important because it specifies shelter needs. Sample surveys were used to estimate the public response.

4. Locate and identify public shelters.

5. Determine evacuation times -- in the final step traffic experts examined roadway systems and maximized traffic flow, then computed minimal evacuation times.

National Weather Service staff in our Houston office worked closely with local government officials in developing operational plans based on the results of this evacuation study. When Alicia began to strengthen, Mr. Steve Harned, Meterologist in Charge of our Houston Weather Service Office, and Mr. Bill Blum, Meteorologist in Charge at Galveston, were both keenly aware of the potential impact on the Houston/Galveston area because they had participated in developing the plans. Telephone calls to local emergency management officials late Wednesday evening initiated action that undoubtedly saved hundreds of lives.

It may take over 36 hours for a complete evacuation of those vulnerable to flooding in the Galveston/Houston area is shocking. For years, we have been striving to provide 12 hours of daylight warning for evacuation. We now know 12 hours of lead-time is not always sufficient. Local government officials must make critical evacuation decisions when the actual threat is hard to estimate. To help them make these decisions, we introduced a new hurricane probability program this summer, and probabilities were issued for the first time during Alicia.

The probability numbers expressed as percentages indicate the uncertainty in the forecast track. Local government officials can now use probabilities to estimate the actual risk and initiate evacuation on an objective basis. The initial feedback from Alicia suggests the probabilities were quite useful.

Alicia highlighted several issues that need to be discussed.

1. There is a further need to develop backup plans that can be initiated when there is a meteorological surprise and primary action cannot be completed. It takes over 36 hours to evacuate those vulnerable to major flooding in the Galveston/Houston area. In a well-behaved hurricane, we might be able to provide that much lead-time. However, I assure you that there are going to be meteorological surprises, such as the strengthening of Alicia, when the warning lead-time will be considerably less than 30 hours, and people are going to be trapped

on the Island. What is the solution? There are not many alternatives when the Island goes under water. One proposal is "vertical evacuation", where people take refuge in substantial highrise buildings. This concept needs to be given serious consideration.

2. There is also a need to improve hurricane forecasting. Over the past several years, we have experienced a significant improvement in our ability to observe and forecast hurricanes. NOAA-operated weather satellites provide new pictures every half hour, both day and night of where hurricanes are forming and moving. When a disturbance is spotted that appears to be intensifying, we dispatch Air Force weather-reconnaissance planes to investigate. If the disturbance strengthens into a hurricane and threatens the United States, NOAA research planes with advanced radar systems, are dispatched to collect high density data required for predicting the path and strenght of the hurricane. Plans are already being implemented to upgrade the data collection platforms on the Air Force planes so they will also have the same capabilities as NOAA aircraft. Finally, as the hurricane nears land, the system is monitored minute-by-minute to fine tune the warnings. This is exactly what occurred in the case of Alicia. The Galveston radar showed Alicia turning northwest on Wednesday evening and prompted refinements in the evaucation plans that saved hundreds of lives.

3. The plans and procedures for developing coastal areas need to take hurricane risks into consideration. I am not opposed in principle to developing barrier islands, however, I am opposed to building death traps. By that, I mean we should not allow more people to locate on barrier islands than can be evacuated in the warning lead-time NWS can provide in hurricane warnings.

Many people feel that the most significant improvements in the effectiveness of weather warnings over the past two decades have not come from technological advancements, but instead are the result of increasing coordination and cooperation among public agencies and the media.

There are three groups of people involved in a complete weather warning. The legal responsibility for processing weather data and issuing weather forecasts and warnings has been delegated to the National Weather Service. Actions dictated by the weather warnings are the primary responsibility of local governments with some oversight at the state level and even less at the Federal level. Finally, the responsibility for transmitting the warnings and the recommended actions to the general population has been assumed by the media. The greater the coordination between these three groups the greater the effectivenss of weather warnings.

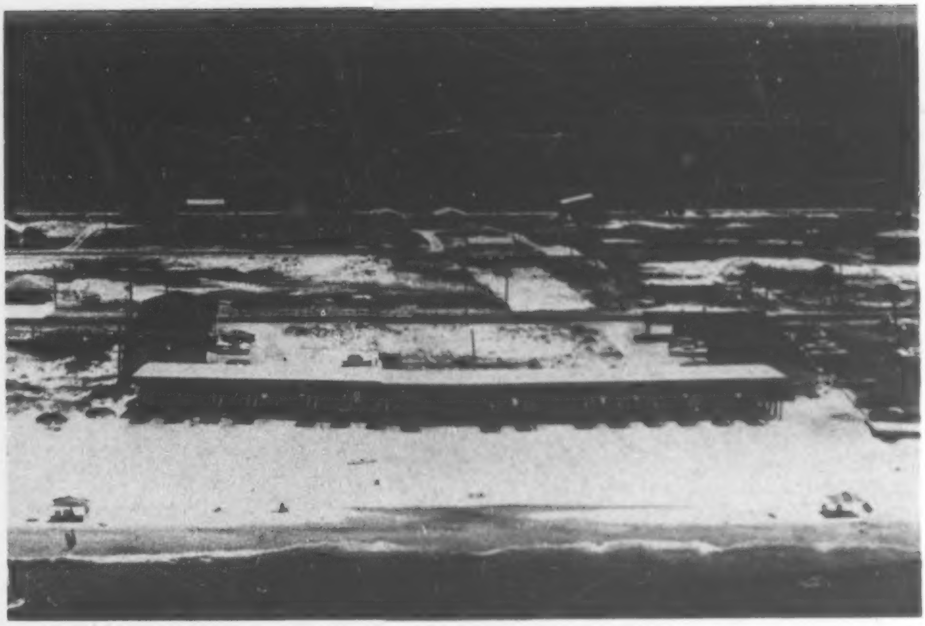
To illustrate the complexity of the coordination process, let me describe the events that occurred when Alicia threatened Texas. As Alicia approached, there were always two or three veteran hurricane forecasters on duty at the National Hurricane Center. One of our primary tasks there is to make a 3-day forecast that is updated every 6 hours. In addition, it was not uncommon to have experienced tropical meteorologists from the Hurricane Research Division of the Atlantic Oceanographic and Meteorological Laboratories (AOML) monitor the predicted track. So before the forecast was coordinated outside of the National Hurricane Center, two to four tropical meteorologists had an opportunity to influence track prediction. The preliminary forecast track was then coordinated with the National Meteorological Center; Headquarters National Weather Service; Headquarters Southern Region; Weather Service Forecast Offices in New Orleans and San Antonio, and the coastal Weather Service Offices in Brownsville, Corpus Christi, Victoria, Houston, Galveston, Beaumont and Lake Charles. Any one of the meteorologists at these locations could have provided input to the final forecast track.

Next, warnings were coordinated with numerous local government officials through our local Weather Service Offices. For example, in Houston and Galveston, there were many telephone exchanges between county officials and local National Weather Service personnel. Once again, any one of these officials had an opportunity to challenge or influence the final weather warnings. For example, an emergency management official could have requested that we delay the weather warnings for another hour or two so that he would have ample opportunity to contact Red Cross shelter officials and have them on location when the evacuation notice was posted.

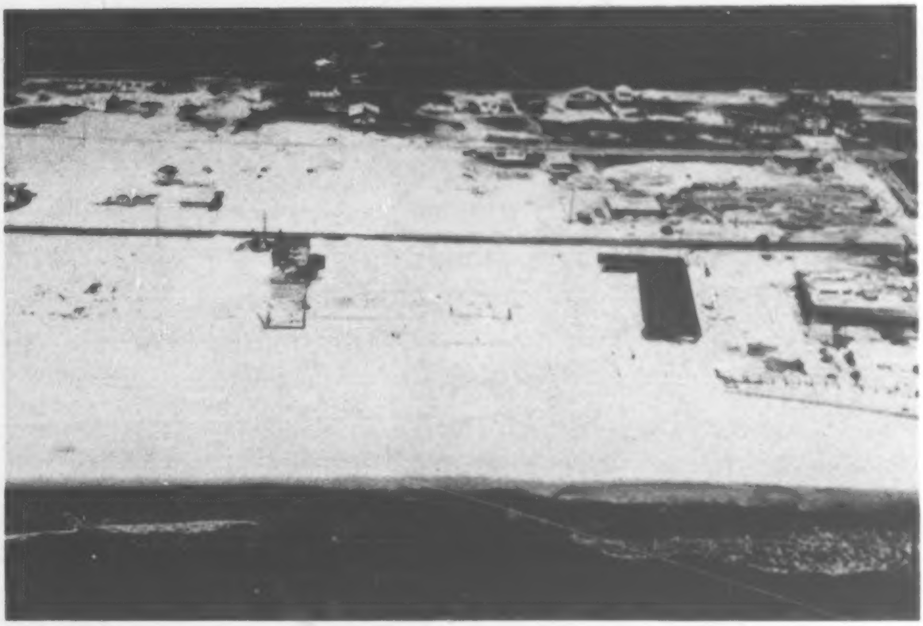
Therefore, before a hurricane warning is issued to the public, it is coordinated with 15 to 20 meteorologists and numerous emergency management officials at state and local levels.

In sum, it is primarily a people problem. Overdevelopment on barrier islands has resulted in potential death traps. In addition to the 26 hours required to evacuate the vulnerable areas around Galveston Bay, we know it is going to take 18 hours to evacuate the Tampa Bay area, 27 hours to evacuate a 6-county area in southwest Florida, over 30 hours to evacuate the Florida Keys, 21 hours to evacuate the Florida coast between Miami and Ft. Lauderdale, and finally, 21 hours to evacuate Hilton Head Island, South Carolina. This does not include decision time nor lead-time to complete the evacuation before the onset of gale force winds.

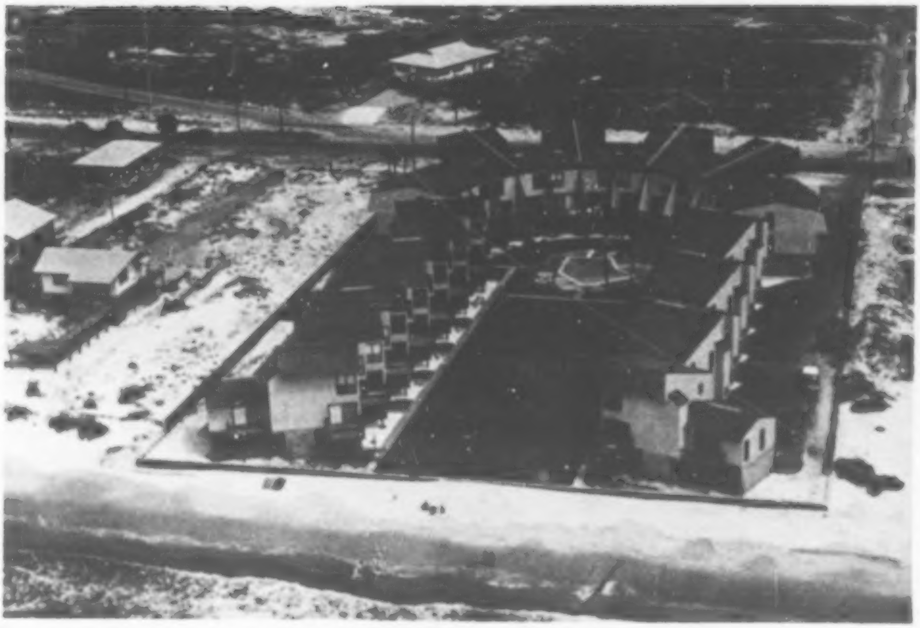
Mr. Chairman, this concludes my prepared statement. I would be glad to respond to your questions.



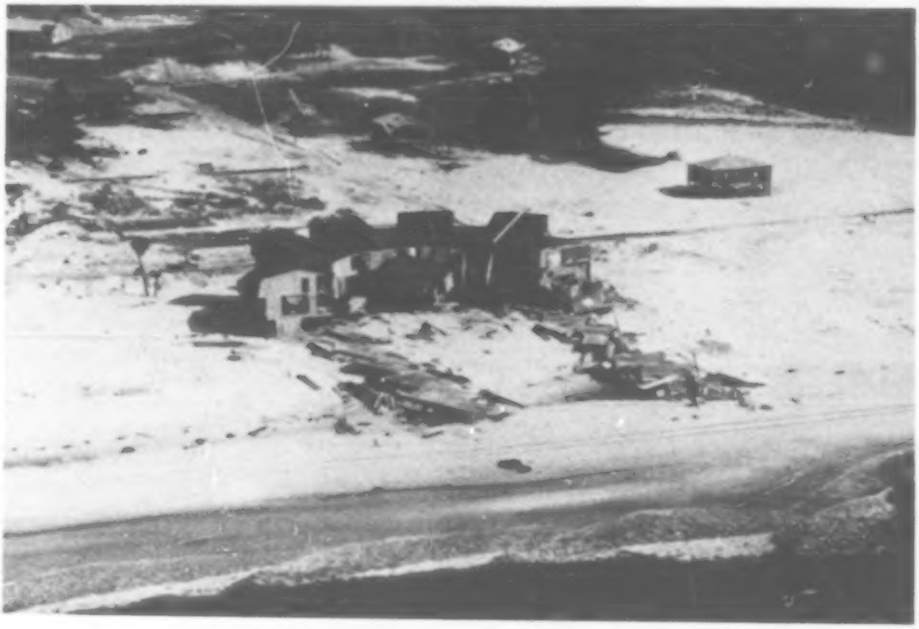
Gulfshores, Alabama—before Frederic—1979



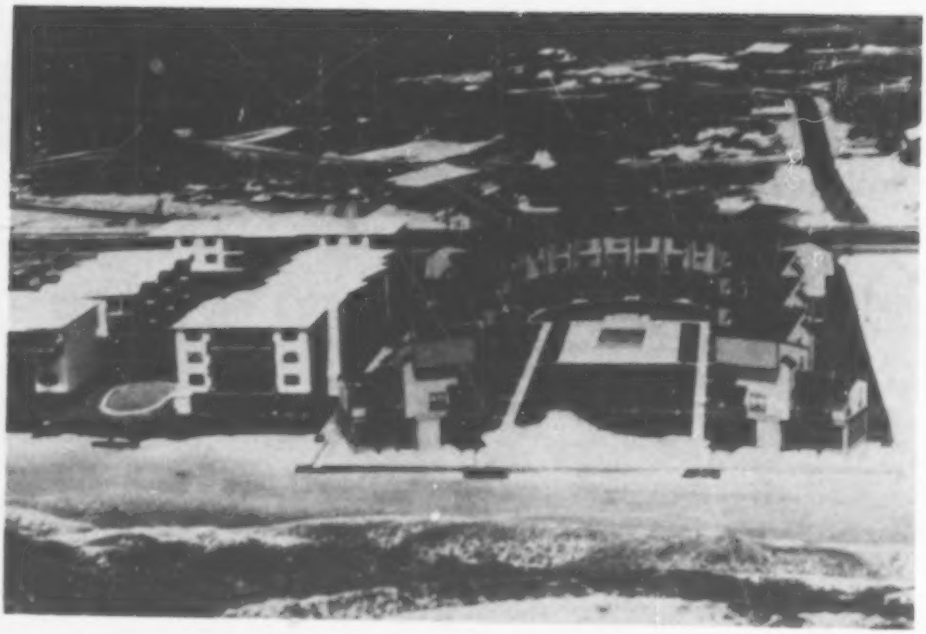
Gulfshores, Alabama—after Frederic—1979



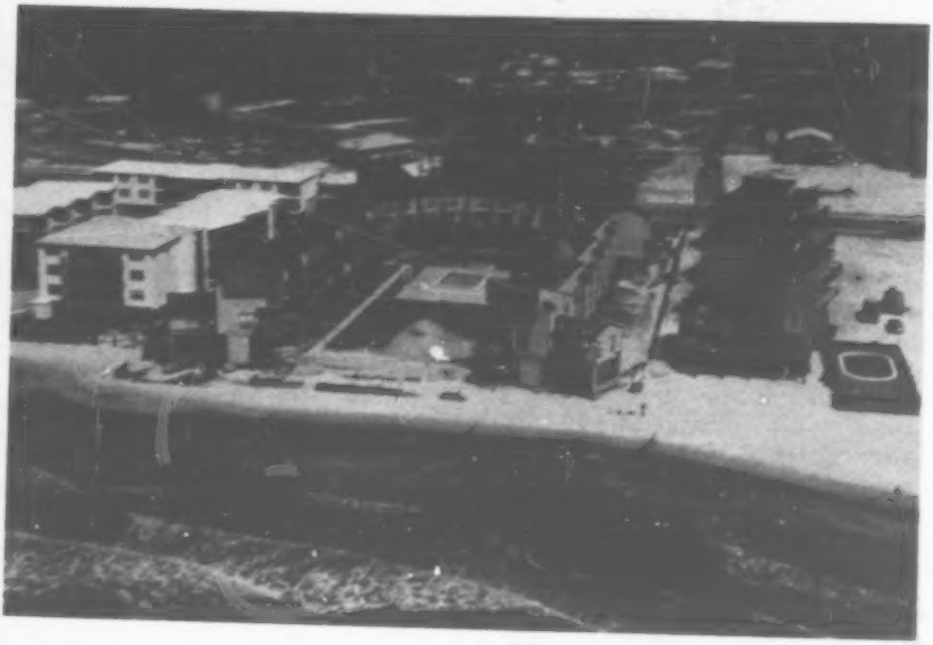
Beachhouse Condo, Gulfshores, Alabama—before Frederic—1979



Gulfshores, Alabama—after Frederic—1979



Gulfshores, Alabama—rebuilt—1982



Gulfshores, Alabama—note seawall—after winter storms—1983

Gulfshores, Alabama—seawall after winter storms—1983

Mr. **Andrews**. Thank you, Dr. Frank.

Steve Harned, with the National Weather Service located here in Houston, is our next witness.

Steve, why don't you go ahead and read your statement, or summarize it for us, before we proceed with the questions.

Mr. **Harned**. Thank you very much, Mr. Chairman, and members of the subcommittee. I appreciate the opportunity to be here today.

We were fortunate with Alicia because the loss of life was kept to a minimum and the necessary evacuations were completed without major traffic congestion. I attribute this to three factors: (1) The fine working relationship between local Weather Service offices and local elected and civil defense officials which provided timely information to the public; (2) also the hurricane sprang up very quickly and those who might have evacuated unnecessarily perhaps did not; and I think very significantly, many people remembered the horrible traffic jams caused by evacuation during Hurricane Allen in 1980 and vowed not to leave.

The Houston/Galveston office of the NWS spends many hours during the year participating in preparedness programs with the various cities, towns, villages, and counties around the Houston/Galveston metropolitan area. Personally, I have traveled over 4,000 miles from March through August sharing in these programs. The most important aspect of this coordination is the development and commitment of close ties with local decisionmakers. These officials must make the hard decisions regarding actions to be taken when a hurricane threatens.

During Alicia, the local NWS office determined when and where certain areas would be affected. This was based on the comprehensive study which Dr. Frank mentioned earlier. We then contacted local officials in those communities and gave them our estimates as to when roads would be cut off by rising waters, or when winds would increase to such a speed that vehicles would be blown over. We suggested actions that local officials might want to recommend to their citizens. During Alicia, NWS and local officials were in total agreement concerning actions to be taken. These included evacuations of Bolivar Peninsula and the western half of Galveston Island on Tuesday, and agreement that travel to and from Galveston Island be completed by dark on Wednesday and that increased evacuation of low-level areas along the western shore of Galveston Bay be completed Wednesday night.

I would like to comment further on actions recommended for the western shore of Galveston Bay Wednesday night. That evening, it appeared a much higher storm surge would move up the bay than had been expected earlier. I immediately called civil defense officials from Dickinson to Baytown relaying this possibility. The effort to evacuate low-lying areas was intensified, and according to the civil defense director of Baytown, hundreds of lives were saved during those precious hours. This illustrates graphically how intimate ties between local NWS offices and nearby jurisdictions can save lives.

Two NOAA Weather Radio stations were broadcasting from the Houston/Galveston metropolitan area during the night. As always, NWR was the fastest source of new weather information. As soon as new statements or warnings were issued they were placed on the radio. There was no delay, filtering or editing of the information.

I would also like to comment on a great concern I have personally about the Weather Radio Service and that is that only a small minority of the citizens of our country are aware of its existence. Yet, this is the best direct link between the National Weather Service and the public. The service is provided by 371 stations on the network around the country. This needs to be publicized.

In closing, I want to mention one concern for the next time. Millions of people were badly frightened by Alicia. When a hurricane threatens again, I fear that hundreds of thousands of people who live in areas not previously endangered will evacuate. I am afraid the resulting traffic jam could make the Allen experience look like a quiet drive in the country.

What can be done now? The answer is that coordination among jurisdictions during an evacuation is a must. Great strides have been made since Hurricane Allen to achieve this vital coordination. The lines of communication must remain open. Weak links need to be strengthened. If this continues, I am sure future evacuation problems will be reduced.

Hurricane Alicia showed us it can happen here. Strong ties between Weather Service offices and local governments enable sound decisions to be made in time for our communities to take protective action and have low loss of lives. We must continue to insure that the close working relationship between the NWS and officials in the Houston/Galveston metropolitan area.

Thank you.

[The prepared statement of Mr. Harned follows:]

STATEMENT BY
STEVEN W. HARNED
METEOROLOGIST IN CHARGE, WEATHER SERVICE OFFICE IN HOUSTON, TEXAS
NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

BEFORE THE

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURAL RESEARCH
AND ENVIRONMENT
OF THE
COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

SEPTEMBER 23, 1983

Mr. Chairman and Members of the Subcommittee:

I appreciate this opportunity to participate in the Subcommittee's study of the prediction and aftermath of Hurricane Alicia.

Hurricane Alicia slammed into the Houston/Galveston area early Thursday morning, August 18, 1983. We were very fortunate because loss of life was kept to a minimum, and the necessary evacuations were completed without major traffic congestion. I attribute this to three factors: (1) the fine working relationship between local Weather Service offices and local elected and civil defense officials provided timely information to the public; (2) the hurricane sprang up very quickly and those who might have evacuated unnecessarily perhaps did not; and (3) many people remembered the horrible traffic jams caused by evacuation during Hurricane Allen in 1980 and vowed not to leave.

The Houston/Galveston office of the NWS spend many hours during the year participating in preparedness programs with the various cities, towns, villages, and countries around the Houston/Galveston metropolitan area. Personally, I've traveled over 4,000 miles from March through August sharing in these programs. The most important aspect of this coordination is the development and commitment of close ties with local decision-makers. These officials must make the hard decisions regarding actions to be taken when a hurricane threatens.

During Alicia, the local NWS office determined when and where certain areas would be affected. We then contacted local officials in those communities and gave them our estimates as to when roads would be cut off by rising waters, or when winds would increase to such a speed that vehicles would be blown over. We suggested actions that local officials might want to recommend to their citizens. During Alicia, NWS and local officials were in total agreement concerning actions to be taken. These included evacuations of Bolivar Peninsula and the western half of Galveston Island on Tuesday, and agreement that travel to and from Galveston Island be completed by dark on Wednesday and that increased evacuation of low-level areas along the western shore of Galveston Bay be completed Wednesday night.

I would like to comment further on actions recommended for the western shore of Galveston Bay Wednesday night. That evening, it appeared a much higher storm surge would move up the Bay than had been expected earlier. I immediately called civil defense officials from Dickinson to Baytown relaying this possibility. The effort to evacuate low-lying areas was intensified, and according to the civil defense director of Baytown, hundreds of lives were saved during those precious hours. This illustrates graphically how intimate ties between local NWS offices and nearby jurisdictions can save lives.

Two NOAA Weather Radio (NWR) stations were broadcasting from the Houston/Galveston metropolitan area during the night. As always, NWR was the fastest source of new weather information. As soon as new statements or warnings were issued they were placed on the NWR.[3] This information was not delayed or edited.

In closing, I want to mention one concern for the next time. Millions of people were badly frightened by Alicia. When a hurricane threatens again, I fear that hundreds of thousands of people who live in areas not previously endangered will evacuate. I'm afraid the resulting traffic jam could make the Allen experience look like a quiet drive in the country. What can be done now? The answer is that coordination among jurisdictions during an evacuation is a must. Great strides have been made since Hurricane Allen to achieve this vital coordination. The lines of communication must remain open. Weak links need to be strengthened. If this continues, I'm sure future evacuation problems can be minimized.

Hurricane Alicia showed us it can happen here. Strong ties between Weather Service Offices and local governments enable sound decisions to be made in time for our communities to take protective action and have low loss of lives. We must continue to ensure that the close working relationship between the NWS and officials in the Houston/Galveston metroplex continues and is strengthened.

Mr. Chairman, this completes my prepared statement. I would be glad to respond to your questions.

Mr. SCHEUER. That was very interesting testimony. I take it that both of you noted during your testimony the role of the Houston and the Galveston Weather Services during Hurricane Alicia. As you know, the administration in Washington is considering proposals to eliminate and consolidate many of the local weather stations in favor of a centralized Weather Service structure.

Now, consider, if you can, what would have taken place during Hurricane Alicia if you had had a centralized Weather Service, and perhaps one Weather Service station in Texas. Could these responsibilities have been handled adequately by a central Weather Service station, let us say in Dallas/Fort Worth? What would have been the impact of these commercialization or privatization proposals in terms of centralization and turning over the services to the commercial sector?

Had that been in effect, can you give us a likely scenario as to the impact that that would have had, and perhaps a differing scenario than the fortunate scenario that actually did take place, where certainly the loss of life was kept to an irreducible minimum?

Dr. FRANK. Mr. Chairman, let me just make some comments on my experiences over the past 10 years. I am not familiar with the details of some of the proposals that you are referring to because I have only seen some executive summaries of some of those proposals.

Mr. SCHEUER. That is all we have seen, frankly.

Dr. FRANK. The executive summaries?

Mr. SCHEUER. We have not had anything that you would consider a workmanlike specific proposal.

Dr. FRANK. Yes, sir.

Mr. SCHEUER. Or cost benefit analysis.

Dr. FRANK. Right.

Mr. SCHEUER. They have all been in the nature of executive summaries and that is the best that all of us have to go on. So, give us the best that you can do.

Dr. FRANK. Sure. Well, one of the things that I am very much aware of is that we have got a very serious hurricane problem. And I cannot provide enough leadtime in all cases to insure a horizontal evacuation. In other words, the technology is not improving very fast. But all isn't bleak. I have found over the last 10 years that I believe we can improve the effectiveness of our hurricane warnings and weather warnings, even though we don't improve the technology, if we have closer ties with our local communities. And so, I have been preaching now for 10 years that we need to have more of the kinds of cooperation that we are referring to here in the local area than we would have if we had some kind of central location.

I just don't believe if you centralized your forecasting in some remote location that you are going to have the effectiveness that was demonstrated here in this particular storm. See, our people were involved in helping develop the plans, and we knew what was going to happen. And when that storm began to strengthen it was a very easy thing to shift gears and to call over to those local government officials who are responsible for initiating the action to encourage them to go ahead and initiate the action.

There are three groups of people that are part of the hurricane warning team. This would also apply, of course, to other weather warnings, too. The National Weather Service has been given the legal responsibility for issuing the warnings and analyzing the technical, meteorological detail. The local government officials have the legal responsibility for initiating the action that is dictated by those warnings. And then the media, of course. relays that information on to the people who need to take the action. The closer ties you have with these particular people, the better response you have during an emergency.

Now, behavioral scientists will tell you that the best response you get during an emergency are based on those relationships that are developed on the day-to-day occasions in the nonemergency. So, when we have good relationships on the day-to-day weather situations in this community with local Weather Service offices and local government officials, then when you have an emergency like an Alicia, there is a confidence that has been built up, so you get good response.

Mr. **Scheuer**. I was very much impressed reading your testimony as to the very easy and relaxed and informal and rather confidence-building formal and informal relationship between the Federal, State, local, and even the nonprofit private sector.

Dr. **Frank**. Yes.

Mr. **Scheuer**. The way they included the Red Cross, for example.

Dr. **Frank**. Right.

Mr. **Scheuer**. The way they looked to the Red Cross for advice on when they should put out the evacuation signals.

Dr. **Frank**. Right.

Mr. **Scheuer**. I was very much impressed by that. That with all of our satellites and all of our computerization, the human factor still enters into it. They still need to contact local officials.

Dr. **Frank**. Yes.

Mr. **Scheuer**. And they still need to plug in the Red Cross for their judgment as to when and how evacuation signals should go out.

Dr. **Frank**. Yes, sir.

Mr. **Scheuer**. Apparently the human equation is still there and the importance of local leadership and local judgment is still preeminent. And all the centralization in the world and all the reliance on high technology can never substitute for good local relationships including being plugged into the private sector groups.

Dr. **Frank**. That is right.

Mr. **Scheuer**. Now, in some places we do have this plural source of information. In Oklahoma, for example, as you know very well, tornado warnings are now issued not only by the National Weather Service but by the Air Force, by TV and local radio stations, and also private meteorologists.

How would this have worked if this had been the situation here? Has there been a history of unauthorized and inaccurate warnings? Has this been a problem in the past with hurricanes? Were they a problem in Alicia?

Dr. **Frank**. I don't think that they were a problem in Alicia except in the misunderstanding of what the storm was all about as I referred to, where apparently some radio stations were broadcasting that it is going to Freeport, therefore don't worry in Galveston where, as a matter of fact, you have size and dimension in a hurricane.

I want to get to the issue of who is right and who is wrong. Hey, I have been in meteorology too long. I am going to make some right and I am going to get some wrong. Meteorology is more of an art than it is a science in many respects. That certainly is true in the hurricane. So it isn't a question of who is right and who is wrong. It is a question of how do we maximize the mobilization of a community so that it can protect its life and its property.

It is more like a national disaster in some kind of a civil disobedience, or some kind of a political enemy that would be trying to make inroads into this country. You don't have 15 generals issuing instructions and letting the troops decide which one they are going to respond to when you have some kind of a threat from an outside enemy. I view a hurricane in the same way. We have got a limited amount of time to maximize our resources and get the people out.

Now, if we don't get started 36 hours ahead of time and mobilize the resources of this community and get them back to high ground, we are going to count the costs in loss of maybe hundreds and thousands of lives some day. So it isn't a question of who is right and who is wrong. I want to get away from that issue.

It is a question of how we can mobilize the resources in this community in the most effective way. That is why I say I think it is absolutely important that we have one voice. See, I am not arguing that it be a Government voice versus being a private voice. If you would come to me and say, "Well, look, we are going to commercialize the Weather Service and turn it all over to the private sector," I would argue just as hard before this committee that you have still got to have one voice.

You have got to have one voice in this community, meteorological voice, if you are going to mobilize the resources. I would also insist that that meteorological voice carry out the kinds of coordination that we are carrying out with our local Weather Service offices with local government. They have to get involved in the decisionmaking process. They have to get involved in the planning. That is a very difficult thing to do if you would turn it over to the private sector.

It is possible but I think it would be very difficult. It just turns out that maybe in this case government is doing something that is very positive.

Mr. **Scheuer**. Well, it seems to me that there is an old adage: "If it ain't broke, don't fix it." You can also improve the technology. But it seems to me that, let us say the human system that you had here worked very, very well.

Dr. **Frank**. Extremely well.

Mr. **Scheuer**. And the coordination between the various levels of government and between government and the nonprofit private sector, as I said before, the Red Cross, was an example of how people can cooperate when there is an emergency; it built confidence and built rapport.

Do you feel there is a need to tear that system apart and building something in its place?

Dr. **Frank**. Well, I would like to see something proposed that would be better than that before we tear this one apart. Don't underestimate the value of these comprehensive evacuation studies. You know they have only been completed in five communities now. We desperately need to complete these in other studies. We have completed them in Galveston, southwest Florida coast, southeast Florida coast, Tampa Bay area.

When you get involved in that kind of a comprehensive study, it brings these groups together. It is tremendously effective, then, when you have a disaster like the Alicia approach.

Mr. **Andrews**. Let us go back to the point you made, Dr. Frank, and talk about those in greater detail. Just as background on this hurricane, it seems like, seemed like in reading accounts after the fact that two things happened that were both very fortunate for people in our area.

Dr. **Frank**. Yes, sir.

Mr. **Andrews**. First of all, the amount of rainfall was a lot less than most folks feared.

Dr. **Frank**. Yes. Right.

Mr. **Andrews**. Second, the storm surge itself was not as bad as it could have been. I wondered if you would comment on both of those instances and give us your view of what could have happened had we gotten 10 or 12 inches of rain in our area, had the storm surge been higher. What kind of situation would the citizens on Galveston Island or in Houston have had?

Dr. **Frank**. Let me make just two comments about the rainfall and then the storm surge. First of all, rainfall in a hurricane is not a function of how strong it is, it is a function of how fast it is moving. If it is moving along very slow, you are going to get a lot of rain. If it is a fast-moving storm, you won't get much rain. You had a tropical storm here a couple years ago, Steve, Claudette? It was very slow moving and you ended up with nearly 40 inches of rain in some communities, and horrendous.

This wasn't that way. It was a fairly fast-moving storm. Now, if you had had a slow-moving storm, then, you see the whole problem of flooding would have been compounded by the inland rains and flooding that you would have had on the inland river systems.

The storm surge, the height of this dome of salt water that sweeps across the coastline is a function not only of how strong the storm is but also how deep the water is offshore. You have fairly shallow water along this area and as you move on toward the Louisiana coast. So, when you have a severe hurricane you can push a lot of salt water up into the community.

Of course, that is what happened in 1900 when a very severe hurricane made landfall here, completely inundated Galveston Island and 6,000 people lost their lives.

Mr. **Andrews**. You mention vertical evacuation. You go into it in some detail in your written statement. I wonder if you would elaborate on that a little bit. How that could be appropriate for Galveston Island.

Dr. **Frank**. Sure. OK. you have got a lot of fairly big buildings away from the waterfront in Galveston. Now, the Federal Building is a good example of one that I can think of. What is it, a seven-story building or something like that? But it is a fairly large building back on the inland areas, and there are other buildings like that.

I believe you could go up to the upper floors of those kinds of buildings and survive. The thing that makes the storm surge so devastating is the water rises, then there are waves on top of it. The wave action literally devastates everything along the front row.

If you go on the western tip of Galveston Island, it is a very interesting experience. You will see the beachfront homes suffered the most damage. You go back to the second row of homes, the damage drops off significantly. And by the time you get to the third or fourth row of homes, there is a lot less damage than there is right on that waterfront.

One of the secrets in developing a coastal area or barrier island is not to put the buildings right into the surf zone. If you put the buildings back 100 or 200 yards, you would be amazed at how much that would reduce the damage potential. So it is getting away from the immediate waterfront.

You have big buildings back into the interior part of Galveston. Then go up in those buildings. If we find this meteorological surprise where you are only going to have 18 hours or 15 hours to complete your evacuation, you can't—you know it is going to take 26 hours of clearance time. You can't complete an evacuation in 15 hours. You have to have some backup plans to take care of those people if this kind of a meteorological surprise occurs.

I can guarantee you that those meteorological surprises are going to continue to occur in the future.

Mr. **Andrews**. Well, this hurricane was the first test of the formula. What are your comments about that formula? I know from my own experience in Washington in our office during that time that there were many people that I think were lulled into a false sense of security by the fact that a 1 is the least severe hurricane and a 5 is a dangerous hurricane. Right up until 45 minutes to 1 hour before the hurricane hit ground our local forecasters and weathermen were telling us it was a 1, and then a 1.5.

I think many citizens were lulled into that sense of security that shouldn't have been there.

Dr. **Frank**. Yes.

Mr. ANDREWS. I wonder if you would comment first, do you think the formula works? Are you pleased with the formula? Should we make changes? Then second, do you concur with that? Should there be some additional caveats to the way the formula is reported to citizens in our area?

Dr. FRANK. Well, you know there are hurricanes and then there are hurricanes. There are hurricanes like the 1900 storm that killed 6,000 people. Then you have hurricanes that are much weaker than that. The kinds of action you take for those two different hurricanes don't necessarily need to be the same.

Now, the success that we have had with this Simpson Hurricane Scale you are referring to, it is merely a relative scale from 1 to 5 that is an attempt to rank the strength of a hurricane; 1 would be a minimal storm and the 5 would be the worst you would expect to have. The reason we developed that was to help people put their past experience in some perspective.

I would go along the coastline and give all kinds of talks. You would talk to a community and say, "How many of you have been through a hurricane?" And everybody would raise their hands and that was the one that occurred 2 years ago. And that was a category 1 storm. "How many of you have been in a 5?" "Oh, I didn't know it could get worse than that." So it helps to educate people using their past experience.

I think it has been extremely effective in doing that. We have been able to place people's past perspective in a lot better order than it was before we had the scale. Again, behavioral scientists tell us we have a tendency to believe that we know more about things in life than we really do. If we have gone through a minor storm, now, we think we know it all. People who were here in 1900 and went through that storm, they know it all. But most of us weren't here, of course, in that storm.

So, I think it has been very effective in trying to place past storms in proper perspective. It was never intended really that we would use this in an operational sense but it has caught on over the last 5, 6 years, to the point now where the first question that was asked when this storm was approaching was how strong is it? What is it on this scale? So we did start conveying that it was a category 1. Never in the written advisories, but that is immaterial because we conveyed it out over the airways.

There is the danger when you have a weak storm and you identify it as a weak storm that people say, "Well, hey, I am not going to worry about that, that is just a category 1." When we first developed the system it was my intent never to use it as a hurricane approach unless you had a 4 or 5. Then we were going to say, "Folks, this is a 4 or 5. This is the worst you have ever expected to have, you better respond."

But in this particular case, the media did expose the 1. And you may be right, that is one of the criticisms that you can make of the system. We certainly wouldn't want to lure them into a false sense of security, because it isn't a category 5.

Mr. SCHEUER. Would the gentleman yield for a brief question?

Mr. ANDREWS. Sure.

Mr. SCHEUER. Comparing that 1900 storm where 6,000 people were killed to Hurricane Alicia, was the difference in mortality caused by the fact that the 1900 storm was of infinitely greater magnitude, or was it caused by the fact that we are a great deal better prepared today?

Dr. FRANK. No, I think it was because the category 4 storm, a strong 4 or maybe a weak 5, and that is what the 1900 storm was——

Mr. SCHEUER. If you had had a 4 or 5 today with Alicia, can you tell us what the results might have been?

Dr. FRANK. That would have been catastrophic loss of life. I can't tell you exactly how much. It would have been hundreds, maybe thousands, if we had had the same number of people in Galveston that were there when Alicia came by.

Mr. ANDREWS. What steps do we need to be taking to prepare ourselves for a 1900-type storm again?

Dr. FRANK. Again, it is a question of having these kind of plans to mobilize the resources and get the people out of the communities if we have enough time in our warnings. If we have a meteorological surprise, we have got to have some kind of backup procedures where we get people off the immediate waterfront and up in buildings back in the interior someplace.

Mr. ANDREWS. Does vertical evacuation work in a hurricane that is ranked a 5?

Dr. FRANK. I think vertical evacuation in some of the more substantial buildings that are in the interior of Galveston would probably work. I think those buildings offer a measure of protection. I will tell you that. The alternative is being in your car and trapped on I–45. I will take the interior of one of the big buildings of downtown Galveston before being in that car on the causeway.

Mr. ANDREWS. Would you care to comment on the formula and your view of the way the formula worked in that hurricane, Mr. Harned?

Mr. HARNED. A 75-mile-an-hour hurricane as opposed to a 150-mile-an-hour hurricane, it is the "one" that is going to give you problems as opposed to the monster that is going to kill and devastate thousands of people and huge property damage. I think it is very valuable. Perhaps it was overused as the storm stayed a 1 most of the time. Maybe that is something we need to look at in the future. If we are asked what scale is the storm, always put a footnote that this thing can change at any time and do not put all your eggs in a basket because this thing—the hurricane, is one of the most unpredictable things in nature.

Mr. ANDREWS. That brings me to another area that I would like both of you to reflect on and comment on that really concerns me. That is the decisionmaking that goes into when do we evacuate an area, and when is a hurricane a serious enough hurricane to tell people to get on the Gulf Freeway and drive to Houston. I sense a problem in that many local officials are deluged with very highly technical, very terribly sophisticated information, and asked to make a value judgment based on what facts they may or may not know.

Let me give you an example. The mayor of Shore Acres, a very small community that may not be able to be called Shore Acres after Alicia went through, they lost most of their shoreline, their mayor was in city hall at the height of the storm with no generator. His lights went out, water was on the floor, and he was there trying to make decisions, with one telephone line, as to whether or not he should tell citizens in Shore Acres to evacuate, what the severity of the storm was. A terrible situation to put anyone in.

Dr. **Frank**. Absolutely.

Mr. **Andrews**. Let alone someone without the sophistication of meteorology.

I am just wondering what your thoughts are about how we can better improve the way we go about making those kind of literally life and death decisions.

Mr. **Harned**. That is a very, very great concern I have, especially for the Houston/Galveston area. This area between Houston and Galveston has so many people, so many different jurisdictions, entities. You have counties, villages, towns, cities, and all somewhat operating independently. But you cannot do that. And again, in the future, the next time this area is threatened and all of these I am afraid hundreds of thousands of people from this area—try to get on the road and get out, you are going to have tremendous problems.

So the answer is cooperation and coordination. It doesn't mean that Shore Acres and Pasadena have to get involved with the decisionmaking at Galveston or Texas City. Just that if Galveston or Texas City say, "Hey, we are going to recommend evacuation, let everyone up and down the line know that these people are coming." This area, it is like a Chinese puzzle, it is so intertwined, and everyone needs to work together.

Mr. **Andrews**. That kind of begs the question. What do we do? What is the step? Obviously there is a void there. There seems to be a gap——

Dr. **Frank**. Sure.

Mr. **Andrews** [continuing]. Between the information, as valuable as it is in the art form that you say it is, and the final decisionmaking that is done by some of these local officials that are not experts in the field.

Dr. **Frank**. Sure.

Mr. **Andrews**. How do we bridge that gap to be sure that the Mayor makes the right decision?

Dr. **Frank**. Well, Congressman, that goes back to the value of these comprehensive evacuation studies, and from that, then, will emerge comprehensive evacuation plans. I want to stress that there is a question. The comprehensive evacuation studies now provide the proper kinds of guidelines for that local mayor then to get plugged into the system.

Now, the next major step is how do we make these very critical decisions with those long leadtimes? If I know that it is going to take me 20 hours to evacuate my community, what kind of tools can we provide that mayor or that local government official so it will help him make those decisions more objectively. We don't have the answers to that one yet. But I am pleased to see that here in the State of Texas the department of public safety and many of your people here, your good local officials in this community are certainly addressing that issue in light of this comprehensive evacuation study.

There is one attempt in Florida I know of to help the decisionmakers make their decision more objectively. The State of Florida has a contract there with a private consultant who is trying to develop some guidelines for those local government decisionmakers to make those decisions.

Mr. ANDREWS. Let me just ask you, how is that information communicated to the local officials? Where, how does he get the information?

Mr. HARNED. In the local area, again, since it is such a—there are so many entities to deal with, what I did during the storm was determine at that time who was in the greatest danger, and then try and work very closely with them. And then use the media very extensively to get the information out to the rest of the decisionmakers and the public. And then when that threat changed, I tried to concentrate on the people who had the greatest threat.

Now that leads to the next question. Why could you not speak to all of the decisionmakers at once? There is no ability to do that now. There is no communication system or net in the area that would allow the National Weather Service to talk directly to all the officials at the same time.

Mr. FRANK. Congressman, I would say, though, that in some State, maybe partially in this State, you have this national, I am not sure what the acronym, national emergency telephone line that does connect by hotline all of—most of your county officials with the State officials. I find that to be an extremely useful tool during the coordination process, because there is where you get the feedback from the local government. We are planning to do something. This is what the meteorology would indicate. If we post a warning, are you prepared then to respond?

Maybe we can get the feedback and leadtime so the local officials can get the proper information. But I want to go back and stress a point, that if you are going to have an effective plan it requires closer and closer local coordination. Most effective thing you can do.

Mr. ANDREWS. Let me move to another area that the chairman touched on earlier and ask you to comment on. NOAA proposes to shutdown 269 weather stations. It would also shut 367 weather radio stations, two of which serve the Houston and the Galveston areas. The planners are urging complete automation of weather forecasting, but most of those who spend their lives forecasting weather have been opposed to this proposal.

An evacuation it seems to me over very narrow causeways, problems with the very things we are talking about, coordination and human decisionmaking that the chairman mentioned in his opening statement, would make me believe that this is the wrong thing for the administration to do. We need local weather offices opened here in our area to help facilitate the very kinds of decisions that we are talking about this morning.

I wonder if you agree with my comment, and if you would expand on it. If you disagree, I would also like to know that for the record.

Mr. HARNED. Again, as Dr. Frank, I have not read the study other than executive summaries and do not know what went into it and what technology perhaps this study sees that we are not aware of. But personally I have two great concerns about what I am hearing. One is the technology. Is the technology going to be available in 10 or 15 years to do this? I personally have concern about that, because it is such a complex undertaking to try to automate weather observing, create a piece of equipment that has to sit out in the weather 24 hours a day around the clock around the year and work flawlessly. I just have concerns about that.

Also I have very, very great concerns about the loss of the local contact which this study seems to indicate that would happen if there were one or two offices in the State of Texas. Say there were 2; each office would have 100 or more counties and county officials to deal with, plus all of the cities and entities inside those hundreds of counties. In the Houston/Galveston area we have 20 counties to work with and we have to concentrate on coastal counties just because of the extreme concern in those areas.

So from a personal standpoint those are the two concerns. I also understand from superiors up the line that unless something comes along that would not diminish our service, surely, and perhaps increase it, until that time we are saying that there will be no changes. This is just what I am hearing from above. But those are my two concerns.

Mr. ANDREWS. Dr. Frank, did you want to comment further about that?

Dr. FRANK. No. I think I have made some comments that address that issue. Again, I emphasize what Steve has said, that we have not seen the report, we have only seen executive summaries. But I go back to a message that we have been trying to convey for 10 years. If we are going to save, minimize the loss of life, we have got to have more local coordination.

Mr. ANDREWS. One more area, and that is one that is of a lot of concern to me, and that is our weather satellites. I introduced a resolution this last week to prohibit the sale of the weather satellites to private interests. I believe very strongly about that. Let me predicate my question, that we should not sell our weather satellites to private industry, for reasons of national security, for reasons of disasters exactly like this one. For reasons of our international relations with other countries, because we should not subsidize private companies like this. The monopolistic problems that are involved. So for many reasons I oppose the sale.

But I want to hear your comments about it. What are your views about the commercialization of weather satellites? Are you in favor of it? If you are, please tell us why. If you are opposed to it, I would like to hear your thoughts.

Dr. FRANK. Again, we haven't seen the details, you know. We have just seen what has appeared in the press. I have two comments that I might make here. First of all, I have a lot of international coordination from my office. See, we serve the interest of the entire Caribbean and Central Americas. As a matter of fact, over the past 5 years I have had the privilege of being chairman of what we call a hurricane committee in the Caribbean. Some 21 nations belong to my committee. I have the directors of the meteorological services of each of those countries on my committee. We meet once a year to try to have a closer international coordination in the same way we are defining the requirement for the local coordination.

We do this on an international scale. As a matter of fact, I think it is rather interesting that we have an operational hurricane plan in the Caribbean. Now there is a lot of international treaties and a lot of international agreements, but there are not many operational plans. And we have an operational plan that involves some 21 foreign countries. We provide those countries, you see, with satellite data.

I would need to know before I could express an opinion what the—how the proposal to commercialize the satellite would want to deal with my good friends down in the Caribbean. I might also point out to you, Congressman, that I have had the privilege over the last couple of weeks of meeting with a number of meteorologists in this country to try to draft up a statement from our professional society, the American Meteorological Society. We hope to have that statement available in the near future, and I think you will find that that statement would suggest that the meteorological profession is not in favor of selling the satellites.

Mr. **Andrews**. I might point out, last week our committee met with members from the House of Lords that came to Washington. And they expressed serious concerns about the international ramifications of the sale. In the Falklands war, the information that our weather satellite gave to their Navy in the Falklands was indispensable.

Dr. **Frank**. Yes.

Mr. **Andrews**. The people that were making the decision in London about what should happen in the Falklands stated to us that they just couldn't have been able to make the kind of decisions they did without our help. And the ramifications of a sale I think we need to discuss at great length and very, very carefully and very thoughtfully.

Dr. **Frank**. Sure.

Mr. **Harned**. From a local standpoint, of course, we do not have the international concerns. We receive these satellite pictures every half hour, just as the hurricane center and other offices around the country. So from a strictly operational standpoint, as long as we receive the photographs or the copies every half hour and are guaranteed that, that would from an operational standpoint suffice.

However, from a taxpayer's standpoint, just a personal opinion, not reflecting the views of any agency, I just have some concern about perhaps—it seems to me from what I understand that this more or less would be a grant or a gift to some company.

Mr. **Andrews**. It is called a subsidy by some.

Mr. **Harned**. And somehow from my concept of free enterprise, there is something missing there. I think in free enterprise you take a risk and the like. But from what I understand here there is not going to be a lot of risk involved. So as a professional, a meteorologist, I don't really care where I get it from.

Mr. **Andrews**. The National Weather Service accounts for some 95 percent of our weather data. I agree. I question whether we should sell our weather satellites when we will have to buy back that very same data at potentially much, much higher costs. One estimate says it could cost taxpayers as much as $100 million a year to go through this transaction.

I thank both of you.

Mr. Chairman, did you have any questions?

Mr. **SCHEUER**. No. It was an excellent panel. We appreciate your testimony very much.

Mr. **ANDREWS**. I might just followup and add, with your permission, that some of us on the committee may want to submit written questions to you.

Dr. **FRANK**. Yes.

Mr. **ANDREWS**. For the purposes of the record. I am sorry we can't spend more time this morning talking. But we will submit those questions to you in writing and make them a part of this record.

Dr. **FRANK**. Thank you.

Mr. **ANDREWS**. Thank you.

If we could ask our local meteorologists to come on up, let's go ahead with panel No. 2. Why don't we go ahead and start?

We have with us today in our second panel, Ed Brandon of KTRKL and Tom Siler of KHOU, channel 11. Welcome this morning to our panel.

We have just been handed Ed's written statement. Tom, if your written statement has already been submitted——

Mr. **SILER**. It is here somehere. Yes.

Mr. **ANDREWS**. Fine. Thank you.

I know both of you came in earlier and heard part of the previous testimony. What I would like to ask each of you to do is to give a brief opening statement, either read your statement or summarize your statement. Then we will proceed right into the questions.

So, Ed, why don't we start with you? I appreciate both of you being here. It is unusual to see both of you on the same screen.

STATEMENTS OF ED BRANDON, DIRECTOR OF WEATHER SERVICES, WEATHER REPORTER KTRK-TV EYEWITNESS NEWS, HOUSTON, TEX., TOM SILER, KHOU-TV

Mr. **BRANDON**. We are normally together once a year at Galveston to judge a blessing of the fleet contest. It is a real pleasure. If I turn around and say Dave, it is because I usually have Dave Ward sitting at my left.

Since I haven't been sworn in and I am not under oath I would like to welcome the representative from New York and tell you that this weather today is typical of Houston weather most days of the year. [Laughter.]

As the weather reporter for KTRK-TV in Houston, I have spent a great deal of time over the past 11½ years dealing with the realities of the climate of the upper Texas coast. The simple fact is that as residents of California face the certainty of earthquakes of varying magnitudes, and as residents of the Northeastern United States can be sure of an occasional blizzard, and as residents of the Midwest face the threat of destructive thunderstorms and tornadoes, so, too, can we in this area be sure that there will be tropical storms and hurricanes. The weather systems will often bring dangerous tidal flooding, heavy rainfall, strong winds, and a myriad of other inconveniences.

It is important, I think, to remember that these weather events which threaten specific areas of the country are natural occurrences. They are elements in the climatology of planet Earth. What turns these natural occurrences into disastrous calamities is simply the fact that people live here. A tropical weather system that strikes an uninhabited island in a remote corner of an ocean is dangerous to no one. But as the population of the coastal areas of the United States increases almost geometrically, there is an increasing threat of loss of life from tropical weather systems.

While it is difficult to conceive that any good came from Hurricane Alicia, it is a fact that residents of this area now know a little bit more about the danger we face. As hurricanes go, Alicia was relatively minor. However, by using it as an example, we in the media and those in government and disaster preparedness agencies must now impress upon the public just how much worse it could have been. Indeed, how much worse it will certainly be. The fact that this area will experience a disastrous major hurricane someday, this is an inescapable reality.

As to the specific concerns of this subcommittee, I can tell you that at KTRK our primary and most essential source of information about weather is the National Weather Service. That was true before Alicia, during Alicia, and remains true today. Our station is not unique in that regard. Wherever you get your weather—from Joe Zona, or AccuWeather, or MetroWeather, or Carmen Miranda on the Today Show—you are getting a weather report based on information collected, analyzed and disseminated by the National Weather Service.

During a hurricane threat, the most important information about the storm itself is provided by the National Hurricane Center. Dr. Frank and his staff have proven time and again that even though there is still a lot we don't know about hurricanes, it is still possible to take what we do know and use it effectively to minimize the threat to life from even the most severe storm. Personnally, I think that Dr. Frank deserves official recognition of some sort. If not one of your medals of honor, at least a plaque for his tireless and near evangelistic efforts to make people aware of the realities of hurricanes.

While the hurricane center is tracking and projecting the course of a storm, the local offices of the National Weather Service in Houston and Galveston provide information that is no less vital. The National Hurricane Center cannot be expected to issue detailed warnings as to how a specific storm will impact, for example, the tidal surge a long a specific stretch of Texas beach. It cannot warn which evacuation routes will be cut off first and which will remain viable. That information can only be provided by the local National Weather Service offices. This localized data is vital to the operations of industry, government, and private citizens as well.

During Alicia, the performance of our local Weather Service offices was, frankly, better than what most people thought possible. Steve Harned and his staff at the Houston office and Bill Blum and the meteorologists on Galveston Island issued literally hundreds of statements, advisories, and warnings during Alicia. Each statement was timely, useful and was issued as soon as was humanly possible. In addition, Mr. Harned and Mr. Blum were available to broadcast live on each of the television and radio stations who were providing continuous coverage of the storm. Their presentations on such occasions provided an important, local voice of authority that greatly enhanced the media coverage of the storm.

Even more than before, I realized during Alicia that there is truly a symbiotic relationship between the local weather service personnel and the media. No matter how timely or accurate their information, it is useless unless the public can be made aware of it. And no matter how many hundreds of thousands of dollars our stations spend on sophisticated electronic equipment, increased staffs, and around-the-clock live broadcasting, it would be meaningless without the information from the National Hurricane Center and the local Houston and Galveston offices of the National Weather Service.

If, after Alicia, there are still Members of Congress or the current administration who seriously propose the closing of either of these offices, they should be prepared for a serious confrontation with Government, industry, and the media in this area. And, on a related matter, it would seem to me that rather than continuing to pursue the possibility of selling our weather satellites, the public would be better served if Congress could find a way to stop cutting the funding for personnel and equipment at not only the Houston and Galveston weather offices, but at weather service offices around the country. I have not spoken to or read about a single professional in the field of meteorology or disaster planning who finds any merit in the suggested private operation of these weather satellites.

And, finally, a word about the hurricane probability forecasting. Alicia was probably not the best test of this innovation because the storm happened so fast. Once our areas was placed under official hurricane watches and warnings, the probability became academic since a watch or a warning implies specific action. However, it must be remembered that from the very first probability forecast to the last the Houston-Galveston area was the prime target. Until now, it is batting a thousand. From Dr. Frank's initial explanation of hurricane probability forecasting until now, I remain convinced that it will be a valuable tool in covering such emergencies. And as the public gains a better understanding of it, probability forecasts can save lives.

I don't think there is anything left for Tom to say.

Mr. ANDREWS. Thank you.

Tom?

Mr. SILER. Ed so seldom gets this much time that he just had to get in all the points. I really, I have a couple of minutes here of comments, more than a speech, and I would like to go back to 1900 when the weatherman for the U.S. Government, Isaac Cline, was walking along the beach down there. He had noticed the night before that the wind had turned out of the north. There were long ocean swells coming in from the southeast. And he had had word a couple of days before that there was a tropical depression, although they didn't call it exactly that back in 1900, down in the Florida straits somewhere.

Well, Mr. Cline went up and down the beach talking to people saying, "There is a storm coming in, you need to leave Galveston Island." Not too many people listened; 7,200 people died, 6,000 of them on the island. Mr. Cline's efforts to warn the people of the impending disaster was gallant, but it wasn't very effective.

Look now at how the National Weather Service and local television, commercial television, reacted 83 years later. First of all, in one live eye report from the weather service, which all the stations did, you could reach about 3 million people. During Alicia the public heard watches, warnings, everything that happened. We took them there for the first time because we have the technology now. And that is a lot better than walking along the beach and verbally warning people to get off. I think we all agree on that.

Twenty-five years ago when we had Hurricane Carla, my station—I have to get in just a little plug for this. My station and Dan Rather, who was the weatherman, my predecessor, was the first station to show continous radar pictures for the first time on television. But it was not our radar. The radar belonged to the U.S. Government. At the same time the radars used in this hurricane, with the exception of channel 2 which has both their radar and a tap into the Weather Service, were still Government radars. It is not our radar. It is a digital version of the official radar on the island owned by the Government, or owned by the taxpayers.

We showed hourly updated satellite pictures of the Government satellite obtained from Weather Services International up in Boston. This is a company, as I understand it—there are two of them, ESD and WSI—who take pictures from the Government satellites, free, and then sell them. Now, it may be they pay some token fee. If the Government is looking to recapture a little of their costs, they might go to these companies and say, "Well, we will charge you a small fee, but don't sell them."

My thought here is that the National Weather Service in the area with people we know, and the technology of our station, their technology, worked and worked well. Somebody has already said, if there isn't anything wrong, let's don't fix it. And I think things worked very well. I have nothing but compliments about the role of the National Hurricane Center in Miami. Dr. Frank, through his ability to communicate and sell, has frankly done more for hurricane preparedness than anyone in history. He probably saved several lives this hurricane season.

But I emphasize the role of the local people. Somehow a message that all emergency precautions should be taken is more serious if the weathercaster issuing that warning can see powerlines, limbs, and roofs going by. And I seriously believe that. Out of all the information all the stations did during the coverage, the most pertinent and most helpful to the people was about 10:20 on Wednesday night when one of the local forecasters said he believed it would be turning a little more northwest instead of west northwest, which meant it was coming from Galveston. So all the reporters with their hair blowing in the wind and their pearly whites shining, this was the most significant piece of information and it wasn't from a central forecast center. It was from a forecaster with family here, who lives here, and was down there watching tree limbs go by and also constantly looking at the radar and satellite pictures.

As far as percentage forecasting, I think it has worked well during both hurricane threats, Alicia and Barry. In city club speeches, and so forth, I haven't heard a single question about it. At the start of the year when we had the meeting proposing it, we underestimated how smart people are. It was no big thing to them. They understood it from the word "go."

That is about all I have to say. I will just edit my remarks to get in some—if you have any questions, I think the Galveston-Houston Weather Service did a splendid job. One thing I would like to say, the biggest question I get is from people wanting to talk to somebody. You know the Government has been cut back so much that if you called the Weather Bureau, you get a recording. I am a one-man department. They call me. I am probably busy. The biggest frustration people have is that they can't talk to anybody. They get recordings.

Say your roof blew off back in May when we had the downpours and your insurance company wants you to fill out all these forms. But you have got to have the date. You call the Weather Service. You get a recording. You call us, I am busy. You call Ed; he is playing golf. Now, what you could do if you want to consolidate, update, bring in new technology, you may want to replace some people. You may want to cut back on manpower again. I say the Weather Service instead of being defensive should be offensive. Let them be more public oriented.

I will never forget the first time I called the Weather Bureau, when I was a 14-year-old disk jockey, to get the temperature. There was this grumpy, unpleasant old guy at Adams Field. Now, you call them and they are public relations oriented. Get them a little computer at every weather station instead of the big central computer in Maryland. Let them keep official records. If somebody calls and says, "My refrigerator was damaged by a lightning bolt some time in February, what was the specific date so I can fill out my insurance form," give them somebody to talk to.

You know, I think the Government interferes quite a bit in our lives. But there is also a time when you need the help of the Government. So again, I would like to compliment the Houston-Galveston Weather Service on their just fantastic coverage. And I know in Washington you deal in specifics. But that is the reason in weather, sometimes you are caught off guard. This is not as specific as getting a bill passed, or something of that nature. Weather is a science that is lacking in specifics.

[The prepared statement of Mr. Siler follows:]

KHOU-TV
Gulf Television Corporation
1945 Allen Parkway
Post Office Box 11
Houston Texas 77001-0011
713-526-1111

September 19, 1983

U.S. House of Representatives
COMMITTEE ON SCIENCE AND TECHNOLOGY
Suite 2321 Rayburn House Office Building
Washington, D.C. 20515

Dear Committee Members:

A few hours before the killer storm of 1900 in Galveston, Weatherman Issac Cline took a walk along the beach. He had noticed the night before that the wind turned due North... long ocean swells rolled in from the Southeast. Cline had received word that a tropical disturbance had been felt in the straits of Florida a few day before.

Issac Cline tried to warn the public...some listened, some did not. Approximately 7200 people died in that storm, an estimated 6000 on Galveston Island itself.

While Mr. Cline's efforts to warn the people of impending danger was gallant...look how the team of the Local National Weather Service Office and commercial television worked so well--83 years later.

In one Live Eye report from the Weather Service Office, one station can reach 3 million people...and during "Alicia", the public heeded the watches and warnings. As "Alicia" approached the coastal regions, we went into our Hurricane Preparedness Plan.

Twenty-three years ago, KHOU-TV had been the first station to show continuous radar pictures as Hurricane "Carla" approached the upper Texas Coast...but it was not our radar, it was the Government's. All during the approach of this hurricane we showed radar...radar owned by the Government and displayed on our digital display. We showed hourly updated satellite picures from the Government satellite, obtained by Weather Services International, and fed to our computer via telephone line.

My thought here is that the Weather Service Office here in our area...with people we know...and the technology of our station, and the technology of the Weather Service--worked, and worked well.

I can be nothing but complimentary about the role of the Hurricane Center in Miami. Dr. Neil Frank, through his ability to communicate and sell, has frankly done more for Hurricane Preparedness than anyone in history. But, I emphasize the role of the local forecasters. Somehow, a message that all emergency precautions should be taken--that evacuation should be completed within the hour--is taken more seriously if the weatherman issuing the warning can see tree limbs, power lines and shingles blowing by his window. Through

KHOU-TV Houston
KOTV Tulsa
KXTV Sacramento
WANE-TV Fort Wayne
WISH-TV Indianapolis
WVEC-TV Hampton-Norfolk
Pembroke Cable Corp
TVS
PGW

Corinthian Broadcasting
a company of
The Dun & Bradstreet Corporation

all of our coverage, the coverage of the other television stations, radio stations, and so forth...the most important piece of information for the public came from a veteran Galveston Forecaster. With the storm some 100 miles South of Galveston, he said, in his opinion... that its center had wobbled--more toward Galveston than its former West-Northwest course. That was an individual making that assessement aided by satellites and radar--an individual who lives here--and who has family here. It was also a Government Forecaster with no pressure from TV ratings, and no pressure to forecast where the storm would go before his competition did. This is something I hope this committee will remember when it considers the Booz-Allen-Hamilton study on letting some private forecasters take over duties of the U.S. Government forecasters.

As far as reacting to the new percentage forecasting used by the Hurricane Center for the first time this year...I have not had a single complaint from the two times it was used during "Alicia" and "Barry." To my amazement, in asking people--talking about it in Civic Club speeches, I found we had underestimated the public's ability to grasp and use something that could help them. I say... keep using it.

Item #4 your staff has asked me to comment on is something I have strong feelings about. My employers pay a private company a great deal of money per month to access their computer for enhanced satellite pictures. However, we use the Houston Weather Office forecast for the most part...for forecasts. In my career I have worked with private weather services and I find them quite adequate. But in a hurricane threat--there has to be one voice, right or wrong...otherwise there is going to be mass confusion. If you were a Civil Defense Director, and Accu-Weather was saying the storm would miss your city...Weather-Sphere, another private service, says it would give your city 20 foot tides, a TV weatherman says only 3 foot tides for your city....what do you do? Despite all the beautiful satellite pictures, the spiral bands of the radar, a hurricane is not a video computer game. It is a life and death situation. I am firmly opposed to dropping the U.S. Government's involvement in local forecasting.

May I tell you about the #1 complaint I get? There is no one you can call about weather without getting a recording. The Houston Weather Office doesn't have enought people to talk to everyone who would like to ask about the weather, or something that happened on a specific date. I admire many of the cost-cutting policies of the Reagan Administration, and automated radars and sounding devices are excellent ideas...but take that savings--give every weather office a small computer and one or two extra people, and a listed number where they can tell somebody who calls about what date the storm blew their shingles off, so that person may fill out the insurance forms.

In summary, the Galveston-Houston Weather Office did a splendid job during the hurricane. It's too bad that our business--the Weather business-is an imprecise science. We will always have complaints that there is 6 inches of partly cloudy on my lawn...or "I got 100 percent of that 30 percent chance of showers today."

But it is a Government agency that is needed. Consolidate, update, let the new ideas and technology flow into the service. Permit the private forecasters to use data--but don't sell the satellites--and don't sell the Government Weatherman.

Sincerely,

Tom Siler
Weather/Journalist

cc: Mr. Urban F. O'Brien,
Office of Congressman Michael A. Andrews

Mr. Andrews. Thank you.

Mr. Chairman?

Mr. Scheuer. Well, I appreciate your testimony very much. In Washington, rather than get hung up on specifics, we tend to get hung up on generalities. We tend to get hung up on ideology. That is true in the Congress where the two parties have at it, at each other on ideological grounds. And it is true in the 18 years I have been around with the succession of administration of both parties; they get hung up on ideology. It is only when you get out to the communities of America, as Mike Andrews and I are doing today, that you learn what real world experience is all about, and when you learn about what the specific realities are when one of nature's emergencies hits. And you learn that you can forget about ideology. And you learn that what you better do is to get down and sharpen your pencil and produce a system that works, and the devil take ideology.

What the local community wants is a system that provides them with the technology and provides them with the human resources that plugs into them, and that they can use to save lives and to save property in the local community. So, you are giving us the specific hands-on information, the specific real world information that we need to bring some degree of practicality, some degree of realism, some degree of human compassion into our legislative product in Washington that too often is poisoned by a lot of ideological nonsense that has absolutely no relationship to the real-world problems that you face in the communities of America. So, I want to express my personal appreciation for the excellent testimony you have both given us.

Mr. Andrews. You know, in truth, all the technical data that we have heard about and discussed today and certainly that we have heard before our committee, all of that information, all ends up sort of on your desk. And you know I think this hurricane, Alicia, points out more than ever the real responsibility people look to you for in terms of direction and making decisions about whether to evacuate and leave their homes, or whether to stay in their homes. Pretty fundamental decisions each of us have to make in a terrible storm like this. Does this system work? Do we need to make changes in this system? How would you grade yourself? And remember, we are being bipartisan now. How can we make our system better, where we can get that information out to that citizen?

I think many people in this storm were confused and somewhat anxious about the formula. I don't have a suggestion for a better formula.

Mr. Brandon. Are you talking about the hurricane probability forecast?

Mr. Andrews. Yes.

Mr. Siler. You were talking about the category?

Mr. Andrews. The category.

Mr. Brandon. The category 1, category 2, category 3?

Mr. Siler. Well, you are wanting something that is too specific again. It was a category 1. It was a small storm. Then it grew. It became a category 2. And it was a minimal category 3. And that top wind, to make it a category 3, was from a plane sounding, not on the ground. So, I think that is something we would all like. We would all like to have 10 days to evacuate the Island. We would like it to be a certain category. But it just doesn't happen that way.

It could have stayed out there and whirled for a couple of days and become a category 5.

Mr. **BRANDON**. As far as our station was concerned and a lot of others, I think most of the talk about the category of the storm and the comparison with storms in the past happened after the hurricane passed. We didn't make such a big deal about whether it is category 1 or category 2. When you are faced with a hurricane watch or hurricane warning, there are a lot of much more important things that you have to talk about than actually kind of sidelights. It is not really relevant when there is a 103-mile-an-hour wind blowing across the sea wall at Galveston whether that is a category 2 or category 3 hurricane. You have got to deal with the wind.

Mr. **ANDREWS**. Good point. Is there a lag time at all between the decisions you have to make and the information you get from the Weather Service, what is going on out there?

Mr. **SILER**. First of all, we don't make decisions. It is our job to report them. I am a weather journalist. My degree is in journalism. I hopped tables in the school cafeteria to get it. I am proud of it. Our job is to report it.

Mr. **BRANDON**. We are a conduit.

Mr. **SILER**. Exactly.

Mr. **ANDREWS**. The point of the question, though, is there a lag time between conditions out there and the information you are getting from the Weather Service? That is what I am concerned about.

Mr. **BRANDON**. Well, the time it takes to compose a specific piece of information that might go on the weather wire. The National Weather Service weather wire is not a high-speed printer as many people are familiar with in other applications, in industry and even in Government. That is one change that could be made. High-speed printers could become standard with the National Weather Service.

Mr. **ANDREWS**. It is both of your opinion, I gather, that what we need is more funding in the Weather Service area, and not the cutbacks in manpower and resources that have been proposed by the administration?

Mr. **BRANDON**. I think of all things that the Government does, probably defense and weather forecasting affect more people than anything else. And I would say weather more than defense.

Mr. **SILER**. I had a thought that if they should turn much of this over to private forecasting, and this is a scenario, we have a hurricane out there, we have stations fighting for ratings. We have one station with AccuWeather saying the hurricane is going ashore at Texas City with a 30-foot ocean swell. We have Weather Sphere, which is another private service, saying no, it is going to Matagorda; there will only be a 3-foot surge in Texas City. We have various private weather services competing, and they have to be a little different. Otherwise, they are not earning their money.

And I think the horrible dilemma this puts the civil defense director in, he has four different, five different opinions. That is why I agree with Dr. Frank. In an emergency situation there has to be one voice. If that voice is wrong, that is the way it works. But there has got to be one voice. I have used private forecasting services and, frankly, one of the things you do in the Snow Belt is overforecast the Government. If the Government says 3 inches, you say 5. In an emergency situation I think there has got to be one voice.

Mr. **BRANDON**. Absolutely. And the private forecasting services as I see it base their forecasts on National Weather Service data. Plus, consider the possibility of RCA operating a weather satellite. Is it possible that perhaps NBC might get first crack at the data? Suppose Time-Life operated a satellite. Might HBO get first crack at the weather data? I don't want to take that risk.

Mr. **ANDREWS**. I wonder if you would rate the performance of private versus public forecasting during Alicia.

Mr. **BRANDON**. I didn't see any difference. All of the private forecast, private broadcast forecasts that I heard, they simply passed along the official information from the National Hurricane Center. I heard specifically Joe Zota from Massachusetts, AccuWeather from Pennsylvania, and one other. Oh, Troy Kemel. But they were all passing along official bulletins from the National Hurricane Center. The only race was who could get the bulletin first.

Mr. **SILER**. Right.

Mr. **ANDREWS**. I am not sure that is a bad thing.

Tom, do you want to comment on that?

Mr. **SILER**. Well, I don't think it is now. But they were in a situation where they were competing and I think it is great to compete every day. But in a hurricane we have all gotten so accustomed to see the enhanced satellite pictures, spiral band on radar, there are people who think it is a video game. It is not. It is a life-and-death situation.

I am just concerned how a person who is doing private forecasting, he is sitting in Pennsylvania, the sun is shining; I am not certain that that person can take it as seriously as someone who is watching tree limbs go by.

As far as anyone being different, I think what they provide, they are most popular in radio. Radio needs new forecasts every hour; television, we have basically three or four shows a day. It is into something called nowcasting. The Government doesn't have time to do that. They can't give a radio station something once an hour, so you hire a private forecaster and they give you a voice. They may use the same forecast the Government is putting out.

In this case I didn't hear anything that would have, although there was one station here whose computer model said the hurricane would go ashore at Matagorda and go due west to San Antonio—I won't mention which station that was. Shortly after they said that I had a call from some guy who lived in Bay City, I think, saying, "Well, it's OK that I don't evacuate." Well, as it turned out I think Bay City had 12 feet of water on it.

Mr. **ANDREWS**. Well, is that a problem in the information they get from the Weather Service? In what form is the information that you get from the National Weather Service? Is it necessary for you to make interpretations, or is it as simple as you mentioned earlier, that you are merely a conduit, that we have those kind of inconsistent forecasts?

Mr. **BRANDON**. The National Weather Service especially during Alicia, the local office and National Hurricane Center is very good at composing and gathering information and composing it so that it is easily understood. We are not scientists, neither Tom nor I have spent our lives studying science. We are reporters. We are no more scientists than sports reporters are quarterbacks or anchormen are politicians or political science majors. I wanted to get that in.

But the information that we get from the local and National Hurricane Center is very well written. Our job, perhaps, is to organize it in the way that fits what we want to get across. Perhaps there might be a bit of information that we don't feel is relevant at that time for our audience. A release from the National Hurricane Center might contain as much information about the impact, possible impact of the storm on the east Louisiana coast. Well, that part of the region we probably wouldn't spend much time on if we gave it at all. So, in that way we edit and maybe reorganize. But we try as much as possible to pass along the information that the experts have decided is important.

Mr. ANDREWS. Tom?

Mr. SILER. Well, in addition to that I have also done something like 525 live remote weather shows.

Mr. BRANDON. Gee!

Mr. SILER. I have been on every highway underwater down there.

Mr. BRANDON. Wow.

Mr. SILER. Make that 526.

Mr. BRANDON. I have done 528.

Mr. SILER. You know something that impressed me? I think television, this may not be something you are delving into, but television did a fantastic job as far as management, the making time available, but some of the producers had never been on these highways that were 3 feet above sea level. They are usually in one market 2 years, then they go somewhere else 2 years. That is why I stress again the need for the local offices.

I was just a little disappointed in all the television stations having reporters generally thinking, oh, my gosh, I wonder if I can get on the network from this "live" I'm doing.

Mr. BRANDON. The Dan Rather complex.

Mr. SILER. Yes; and I was very disappointed. And perhaps even in myself that we were thinking, gosh, I wonder if I can get on the network this report, instead of how can I get this information across and can I save any lives.

I know probably you are not grading, you didn't mention grading television. I give myself an A; a B-plus.

Mr. BRANDON. You are grading on the curve.

Mr. SILER. Right. I think we did an exemplary job. The big individuals who own television now—and no individuals except those who have a lot of money can afford to own television—I think they did a splendid job. I think in another situation like this I would like to see more live eyes of the mayor of Texas City, the mayor of Galveston, the civil defense directors, instead of reporters being flapped about by the wind, because that is real information. It is not a video game. It is a life and death situation. And this was a baby hurricane—a very small hurricane. So, I give television, all the stations an A, but we could have been an A-plus.

Mr. ANDREWS. Let me turn to something else. "Texas Monthly," in the October edition, quotes that "the National Weather Service continued its disturbing trend toward providing less and less useful information. As Alicia neared the coast, advisories omitted the essential fact of how far from the center hurricane force winds extended." I wonder if both of you would comment on that. Do you agree or disagree with that statement? Is that a valid criticism?

Mr. SILER. It was valid up until it approached the shoreline, then they started including it. And I am not sure why. We all commented on it. I had several calls about it. I assume because it sprang up so quickly, maybe they didn't have enough planes out of Keesler Air Force Base to fly into it.

But, yes, I did notice that. But their article is erroneous in that as it got about 75 miles offshore, then they did start including it. I think it extended out 50 miles in diameter, maybe 75.

Mr. BRANDON. Dr. Frank can tell you better. You are right. As it began to approach the coast, they included that information. I don't know why it wasn't included all along. I am sure there is a good reason.

Mr. ANDREWS. What about reports in the press after the hurricane that the Weather Service has been over a historical period giving out less information. Is that accurate?

Mr. SILER. No.

Mr. BRANDON. Absolutely not.

Mr. ANDREWS. It seems like you are saying that to us this morning.

Mr. BRANDON. Absolutely not.

Mr. ANDREWS. Just the opposite is true?

Mr. SILER. They are giving more, as with the hurricane forecasting probability.

Mr. BRANDON. It is not the amount of information you give out to begin with; it is the usefulness.

Mr. ANDREWS. And quality. The radar station at Galveston Island I think went out about 2 a.m. Tell me what your thoughts are about the consequences if we had not had some kind of backup radar installation. One proposal, as you know, is to shut down that radar installation. How necessary is it there for you to be able to make your forecast?

Mr. BRANDON. There is a network of radar installations along the coast of the United States that starts at Brownsville and extends through Corpus Christi and Palacios and Galveston and Lake Charles and New Orleans, all the way up to Maine. And I would hate to see the virtually only gap in that network be Galveston Island.

Not only that, it is, let's face it, a historic installation. It is the oldest weather station in the State. It has been there a long time. It is one of the few places in Texas that you actually have official records that go back more than 100 years. That is valuable climatological information.

Mr. ANDREWS. Sure.

Mr. BRANDON. Why stop gathering that data?

Mr. SILER. It is. It is an emotional thing. You might have a war, a real war between Galveton County and Harris County if you try to move that to Houston. And it doesn't matter. Actually, the ground clutter is so bad around the radar site that the people in Galveston would be a little better off if it were moved to Houston or even Waco. But, emotionally, leave it alone. If it had been up here a tree limb would have fell on it. Something would have happened to it.

Mr. **Brandon**. The person that makes the decision, make them tell Holbrook.

Mr. **Andrews**. Is that a valid reason to move it to Waco or some inland area?

Mr. **Siler**. No; I don't think so. I think it is fine where it is. You have a lot of ground clutter, or inversion, at this time.

Mr. **Brandon**. The reason radar installations are not in major cities is because the ground clutter pattern around the radar would cover the city. As channel 2 found out. They always use their, we can talk about them since they are not here. They always had their own radar, and then it became possible to get remote radar from the National Weather Service. Channel 11 and channel 13 did it. Suddenly, we were able to show a radar image that showed nothing over Houston but rainfall, and channel 2 very quickly got the same system. But San Antonio radar is in Ponder; Dallas radar is in Stephenville. That is why radar installations are always 25, 30, 40 miles away from the major city it covers.

Mr. **Andrews**. One more area, and that is the commercialization of weather satellites. I know you have heard my views. Ed, you didn't speak to that specifically. I wonder if you would share your thoughts about it.

Mr. **Brandon**. Well, I just don't think it is a good idea. As I said in my statement, I have not spoken to or heard of a single professional meteorologist or person active in disaster preparedness who sees any merit at all in the commercialization of the satellites. I think your resolution, assuming the facts in your resolution are even halfway correct, pretty well says it. Why sell it for $150 million to $200 million to get the data back? Tom was absolutely correct. Let the Government go into competition with private consulting meteorologists. They can make a lot of money that way.

Mr. **Andrews**. Mr. Chairman, any followup questions?

Mr. **Scheuer**. No questions. I very much appreciate your testimony. It was excellent.

Mr. **Andrews**. I want to thank both of you for being here today. Appreciate your testimony.

Mr. **Brandon**. It is awfully early.

Mr. **Siler**. It sure is for us.

Mr. **Andrews**. Why don't we take about a 15-minute break. I know some of you want to ask the chairman some questions. Let us do that for a while before we continue with the next panel.

[Recess.]

Mr. **Andrews**. Why don't we go ahead and start with our third panel, and that is Mayor E. Gus Manuel of the city of Galveston.

Mayor, thank you for being here today.

STATEMENT OF HON. E. GUS MANUEL, MAYOR, CITY OF GALVESTON

Mr. **Manuel**. Thank you.

Mr. **Andrews**. I appreciate very much your appearing before our subcommittee. As I am sure you heard earlier, this is part of a series of hearings that are being held by the Science and Technology Committee, and specifically the Subcommittee on Natural Resources, around the country, dealing with weather information, weather forecasting, hurricanes in general. And our purpose is to gather as much information and opinion as we can from local leaders, local officials, local technicians and weather experts before drawing any type of conclusions about how we can make our system better.

And, certainly, of concern to all of us here today in our area is how we can better prepare ourselves for the next hurricane. As we heard from our two local weathermen, it is inevitable that we will have a major hurricane strike the cities of Galveston and Houston again. And it is certainly timely for us to be considering how we can work among ourselves to make things better.

Please go ahead and give us any type of opening statement you would like to make.

Mr. MANUEL. First, Mike, let me say that I want to thank you and the panel, the committee here for allowing me to participate here today in the hearings, and also to address myself to you. When this first came about, at least I heard about it, thinking somewhat back after the storm a couple of days when the NOAA people and weather people from Washington came down to talk about the Weather Service, and now hearing of your committee, I feel that it is necessary that perhaps I at least express our views of our community in regards to the National Weather Service.

First of all, let me say that we think we have done an excellent job. I think that Neil Frank and his people have done an excellent job as well. But I think more important to us is the local Weather Bureau. I want you to know that they worked hand in hand with us. On our first meeting that we had they walked over and they sat with us and told our committee and our staff that we were to discuss the preparation of this storm. And in turn, we communicated back and forth to their office, which is two blocks from us. And we were able to pick up the available information that was needed by us at any given time. So we were right up on the information.

As a matter of fact, some of that information we received from the office was before it came off of our teletype that we have up there. We feel that they have done an excellent job. I left the Weather Bureau at 12 o'clock on Wednesday night up there. I want you to know that, and I still have copies in the files at city hall, that the storm, by the Galveston Weather Bureau, had been pinpointed to within 50 miles in either direction of where it might hit and exactly where it hit, we knew where it was going to hit.

We were off a little bit on the time, but as far as knowing where it was going, it was pretty much on, especially when it took that change a little after 10 o'clock, more northwest than it was west northwest. So every civil defense coordinator, people involved in civil defense, city council, citizens of our community are very appreciative of the local Weather Bureau.

The only thing that we ask is that instead of giving thought of closing it down, that you step up or increase the facilities there. I know that the radar is old. We know that it failed at 2, or 2 something there. Of course we would like to see something new in that area. We understand it costs an awful lot of money to operate. It costs us an awful lot in our community and gives us a better understanding of what it costs you. But we feel it is very necessary that the Weather Bureau be allowed to maintain, especially in maintaining Galveston.

I don't think Houston or Fort Worth or some of these cities today is the place to have the Weather Bureau. I think it ought to be right there. It is on top of the post office. As I say, it is right down the street from us and we communicate very well. It has done an excellent job. As we told the people after the storm 2 days from NOAA and Washington that came down to investigate that we take our hats off to Bill Blum and Steve Harned. They have done an excellent job.

Mr. ANDREWS. I think one of the things that is of concern to me and some of the members of the committee is how local officials go about making decisions as to whether to evacuate or not. There is nothing more basic I think in a hurricane than that final decision that you and other mayors in our community and public officials make when they have to decide whether to tell people whether to leave their homes or to stay in the face of the storm.

Are you satisfied with the way you get information? Are you satisfied with the system that we have now? Do you feel that you got sufficient information to make the decisions that you made? If not, would you suggest to this committee, and therefore the National Weather Service, any changes that should be made?

Mr. MANUEL. Well, let me say this to you. Of course we have the teletypes that come in not only from the local station but from New Orleans, down the coast, all the way to Fort Worth and from those areas we get briefings that come over this teletype. But let me express this to you. In this particular storm it came up so quick, and I think that the Weather Bureau did a nice job.

Now, in Allen, I think it was a little bit more alarming and more people evacuated. More people still remember Allen today. I am not so sure the right thing happened in Allen, because the fact is that people who leave their homes and their treasures, they know that something is going to happen. If they are there, they can protect them. Allen put them all on the roads, and trying to get to Houston, by an evacuation plan which we tried to work with Houston, and there is just no way they can give us a special road through here; they are backed up.

If the tides are rising and the wind is blowing hard out there, and you have got a car full of kids out there who want to go to the bathroom and you can't go forward, you can't go backward, you can't go sideways, you have to wait for a decision from the Weather Bureau. In this particular case, we believed it was going to be a mild disturbance and we kept up with it from the beginning, the warning signals and then when it became a storm. When it went in, of course, it was after 10 o'clock I guess when we all got further thoughts about the hurricane. But I think evacuating the island in Allen might have put more into the people's minds and maybe more of them would have left this time had it not been for Allen and the fiasco that was.

They all went to Austin. And when they got to Austin, there was no place to stay and all the tornadoes were behind them. So I think we have got the finest weather technology there is, and keeping us abreast, and this was a mild storm, we may have had some whirlwinds that might have destroyed—I think one of the biggest things is probably what Neil Frank has been talking about for years and years about building on the beaches. But I think we have become very lax in the structures even though we have the building code and anticipate strengthening it, or have already started to strengthen it. Some of these buildings are constructed with staples and they are doing nothing but breaking loose——

Mr. SCHEUER. Excuse me. Are you suggesting some of the buildings within downtown Galveston do not comport with the building codes?

Mr. MANUEL. Some of the structures on the beach front and Galveston Island, they complied with it. But while the staple guns are allowed I am not so sure that that is what we should have. We probably ought to eliminate staple guns because if you look at most of the roofs down there they are just all gone.

Mr. ANDREWS. I might add, these photographs over here—you may not have seen—which Dr. Frank brought us of Gulf Shores are absolutely staggering, when you see a restaurant and then a deserted beach where the restaurant was blown away. And now a condominium on the same spot that may or may not be sturdier than the restaurant.

Mr. MANUEL. Are these some of the old pictures he had?

Mr. ANDREWS. What do we need to do, Mayor, in terms of building standards in areas like Galveston?

Mr. MANUEL. We are looking at that. We have a task force to evaluate the structures that are there and the future construction. And we are going to strengthen the building code. We are still evaluating and receiving recommendations of the task force. And we have put some moratorium on some structures down there until we see what, you know, the recommendation is, and how we are going to change that.

But believe me when I tell you this. I think that the Weather Bureau, I am not so sure about your percentage deal as of yet. It has taken a little time to take hold of that.

Mr. ANDREWS. What do you mean by the percentage deal?

Mr. MANUEL. Well, they have this percentage deal now, 10, 15 or 20, whatever, it is relatively new, just coming in.

Mr. ANDREWS. What does it mean to you?

Mr. MANUEL. I am not so sure in the minds of people that it is going to hit them, or it may pass them or so forth.

Mr. ANDREWS. What is wrong with that system?

Mr. MANUEL. I don't know that anything is wrong with it. I am just saying that I am not so sure the people have grasped it yet and that they fully understand it. Maybe a year or two from now they will understand a little bit better and comply with it a little bit more. But as far as everything else, we think as I say they do a good warning system. They have high technology. We had new improvements within our system in Galveston. I think it is an advantage not only to our community but all the surrounding communities because we are probably the most—we are better protected for hurricanes than most areas in the country are.

We have a lot of old home structures on high ground, plus the sea wall boulevard. Whereas the radar system is protected behind the sea wall, it could take care of Freeport, right on down the way; then the other way, toward Port Arthur as well.

Mr. **Andrews**. Mayor, going back to the decisions that you have to make, and other mayors have to make, do we need some kind of coordinated educational system to help indoctrinate new public officials to the services of the national—had you just been elected mayor of Galveston and you found yourself in that situation——

Mr. **Manuel**. Be in trouble.

Mr. **Andrews**. Would you have felt ill-prepared to make those kind of serious decisions that you were having to make?

Mr. **Manuel**. Yes. Let me say this to you. The Texas Disaster Act is a big book. You get that when you become mayor. You study and evaluate it. That is the rules. But you don't always comply with the rules; if something reaches the time that you have got to make some changes in it.

I think with all the meetings we attend to over the years—and they are important—we attend National Weather Service meetings every year. But we also—A&M College comes down to participate. We participate with other local communities and get viewpoints. Now, we have meetings once a month. I don't participate in all of those. It is in Texas City over there. But I think that on the overall basis, everything is on the right track to be honest with you.

Mr. **Andrews**. Dr. Frank, in his testimony earlier today, suggested what he called a vertical evacuation in the Galveston area, whereby folks would go into high-rise buildings rather than leave the island. Would you care to comment on that proposal?

Mr. **Manuel**. Well, I think it is the smartest thing to do. In this particular storm if we would have evacuated the island, we would have had to evacuate it before the storm even got there, for the length of time it takes. It takes us about 36 to 40 hours to evacuate the whole island. We have reached agreement with the communities surrounding us that the western part of Galveston would leave first, the local part second. But I recommend that people go to high ground and old stuctures or to sheltered areas if they felt uncomfortable with the storm and didn't want to ride it out.

Now, our sheltered area in this particular storm had less than 1,000 people. I really feel that people want to protect their property. Right to this day people tell me that if they wouldn't have been here they would have had more damage than they did. So they want to protect the things they have worked all their life for.

But the other thought still lies in people's minds is Allen, when these cars were bumper to bumper on that highway and going nowhere, and people still remember that. So sometimes, and this may be a horrible thing to say, but sometimes if we cry wolf too loud and the wolf don't come, like in Allen's case, why then people don't want to leave on the next one when it really does come.

Of course the projection here was mild. If this would have been such as Allen, where it was projected I believe the worst hurricane of the century, I am sure more people would have taken more steps to leave. But they gave us the honest and truthfulness what they felt. It started off as a warning, then started off as a 1, then a 2, and barely made a 3. So my personal feeling is that they did an excellent job and that is how we based our decisions, is on what the

Weather Bureau in turn tells us, because we keep up with it constantly.

Mr. **Andrews**. Dr. Frank also mentioned that overdevelopment on barrier islands has resulted in potential deathtraps, as he referred to them. Is this situation true in your opinion? Is it getting worse? Have some Federal policies, the national flood insurance or building loans, whatever, actually encouraged overdevelopment?

Mr. **Manuel**. Well, FEMA now has a plan that if you build on the western part of Galveston Island that the bottom of the floor, the joists must be at least 18 feet. So I think they have taken some protective measures. I can say that maybe in some ways I agree with Dr. Frank in regard to the overdevelopment of a barrier island. We are seeing that happen on our island. The thing is in our particular case and how we view it is the fact that it is a tax base to our community. It is an outlet for the people of the city of Houston to get away. An enjoyment for them. They like to fish. They like to come down there and share the city with us and share our beaches with us, and we want them to do that.

I say our beaches. It is their beaches as well. But we want them. Houston is very important to Galveston. Because if it wouldn't be for Houston, we wouldn't be where we are today, because Houston's growth has automatically dropped on Galveston.

Mr. **Andrews**. One of the things that is unique to Galveston, and I assume was unique to you in this hurricane, was that logistically you were close to the information physically.

Mr. **Manuel**. Very close.

Mr. **Andrews**. What would have happened had you not been physically close? My concern is, some of these other mayors and public officials in areas where the Weather Service is not down the street, where they have to rely on television or on radio, or they have to use the telephone, all of which may be disconnected at some point, what suggestion would you make, if any, that you think needs to change, or that we could change in formulating some policy about the way information is transferred to local officials?

Mr. **Manuel**. Let me say this to you. That I think that they started on the best system now. This fellow, I believe his name is Chuck Wolf from the station up here that developed that PIES system. We are not fully set up for it as of yet. We are building a new OEC because for the first time in 20-some years that I know of we have managed to appropriate some funding for civil defense, radios and the EOC room, and anticipating this year to put in high-rise vehicles. But I think the community or Weather Service, if they communicate to the eye, which is supposed to be that everybody is to get the same information that comes over the radio, and it is not to be sensationalized or dramatized as we find in some news people.

I guess, and this may be a bad thing to say because there are a lot of news people here, but probably the worst thing that happened to us was the news media. Because first we had people from all over the United States of America and we had more people from Florida than any other city, I mean any other State in the United States. We must have had at least 10 or 15 different cities from Florida that were constantly there during the hurricane. And since the hurricane we have had them still contacting us, radio stations and TV stations, still calling about what we are doing and what is happening. But the media in many ways did hurt us.

Mr. **Andrews**. Please tell me why? How is that so?

Mr. **Manuel**. It hurt us in the long run. First, it told about the storm. If everything we went through were sensationalized or dramatized, it would have been better. But I received calls from Oklahoma, say, which said, "Man, there isn't anything left down there." It was dramatized and sensationalized there. They weren't even complying with the setup here. They were giving their own view.

But the aftereffects have really affected Galveston. I know the director of the Galveston—whatever—said he had 25,000 tons of cargo that was stopped from being shipped to Galveston so he called and wanted to know what happened. He says, "Well, Mister, you had a storm down there." We said, "Yes, but we are dry." He said, "Mister, evidently you don't read the newspaper, or you don't watch television because your city is not even there any more."

That hurt us. That is over 25,000 tons of cargo. When over 50 percent of your business is waterborne activity, it hurts us. The tourist business was hurt tremendously. While some of the hotels were knocked out, that was on the news media, and telling you there is no place to stay, you have to stay in Houston if you want to come to Galveston; you can eat at a restaurant but you can't stay in a hotel down there. Well, all of these things partially was true, but not all of it was true. So as I say, they hurt our community in the long run.

Mr. **Andrews**. Let me turn to another question. What kind of minimal information do you think you need to have to make a decision to evacuate or not? What, in your mind, in this instance would have triggered the need to request an evacuation? At what point in time do you try to make—do you have to make a decision, yes, to evacuate? And what kind of information were you getting to make the decisions that you did?

Mr. **Manuel**. As I said, we get firsthand information from the Weather Bureau. That is strictly what we rely upon. We watch the tides as they flow and we know the low-lying area roads that you can't escape from. That is when you put out the low-lying evacuation area. As the time goes on, if you see the tide is rising and then there are other areas that need to be evaluated.

In this particular case for this storm here we asked the low-lying people to evacuate. And the other people who were uncomfortable and wanted to leave the island, we asked them to leave by 2 p.m. on Wednesday. We extended that time to nightfall, say, 7 p.m. on Wednesday. And then we extended that time until midnight for them, if they weren't comfortable and wanted to get out, leave the island. We gave them three separate times for them to leave. And we feel that, you know, with all the news media and the Weather Bureau that was putting out their information as well as what we were, that those who choose to leave would leave by that particular time.

You could have shot a cannon down the highway, say, at 7 o'clock at night because there was nobody leaving. And you know we can't make them leave. Can't make them leave at all. As I say, I think Allen still lingers many times in people's minds right now, because getting to Houston to evacuate, getting past Houston is a job. Especially in the event of a disaster.

We talked to Houston, police department, sheriff department, EPS. We talk about disasters and they tell us, "Look we have two disasters every day, in the morning and in the evening. So how can we give you a highway?" And they can't give us a highway. We do have routes, but they are not going to stop their traffic for us to get through there. The high ground, old structures is what I suggest they go to, or the shelter areas. But the shelter areas, as I said, had less than 1,000 people.

Mr. ANDREWS. Should we have a system where one appointed official, possibly in State government, possibly a person with the National Weather Service, makes that decision to evacuate? Is that a good idea?

Mr. MANUEL. Well, of course, you do have that already, if you want. The Governor has that authority. In turn, he has appointed mayors to make that decision for their jurisdiction. Or you could have an interjurisdictional area and then have one authority within that. But my personal feeling, I think the way the system is set up now, there is nothing wrong with it. There are always people that are going to complain. You can't please the whole world. There are some who would like you to have this meeting, and some who don't want you to have this meeting. You can't please everybody, and there are critics about everything.

I personally feel the system is good and is very operable, providing to—to comply with the rules outlined.

Mr. ANDREWS. What kind of system do you have to coordinate with other local cities in our area about those very kinds of decisions?

Mr. MANUEL. The evacuation you are referring to?

Mr. ANDREWS. Yes.

Mr. MANUEL. Oh, I guess it was in May 1981, I don't have my papers with me. There is a group of cities within the Galveston County area that had reached an agreement. We all signed it and send it to the Governor. And the escape routes that were to be used, and who was to leave first, and second. First to be left was the lower part of Galveston Island, and second was the city of Galveston. Then third was Lamar, Texas City and Hitchcock, so that the highway wouldn't be congested.

But all we asked to evacuate was the low-lying areas at this particular time, and the other people chose not to do that.

Mr. ANDREWS. Were you in communication with the La Porte mayor, the Deer Park mayor, the Seabrook mayor? Is there a system where when you are on the ground in Galveston trying to make a decision whether or not to put people on the Gulf Freeway, to notify these other mayors what you are doing so they can make decisions based on traffic flow, based on weather information that they may not be receiving?

And let me just speak to a specific instance that I saw a real problem in this last one. And that is: some of the areas in my district were so cut off, especially in a very small community like Shore Acres where they don't have all the facilities that a larger urban city would have, all the means of information that you would have, that the mayor of Houston would have—is there a system in which that mayor if he were to order evacuation, would have knowledge of what the traffic congestion patterns were at a given time or would be. I would think that would be extremely important to him.

Is there a way where that kind of information is shared?

Mr. MANUEL. No. The only one I know of is the county of Dickinson. See our concern is with our county and we aren't concerning ourselves with Baytown or Deer Park or those particular areas.

Mr. ANDREWS. But don't you think that we need to have some kind of coordinated system between these communities, because what happens in Galveston County in the midst of a hurricane is certainly going to affect what happens in southeast Houston and southeast Harris County.

Mr. MANUEL. I agree with you. Of course that is something that would have to be coordinated through the emergency management service or EPS. Our concern is our community. And the EPS, the emergency management service, they would have to coordinate something like that. I don't have any regulations on it.

Mr. ANDREWS. That kind of goes back to the question I asked before. Should we have a regional official that maybe is in a better spot at any given time during a disaster like this to make those kinds of judgment calls? Or is it more important to have a local mayor making those kinds of calls himself on the spot. I am concerned there is not enough communication between some of these cities, the mayors of Shore Acres, Deer Park, or La Porte may decide to evacuate not knowing that access to the Gulf Freeway, or the few escape routes we have are not sufficient.

Mr. MANUEL. Well, what you are saying is that you feel that there ought to be several counties with interjurisdictional, and the Governor has that authority to appoint that now if he wished. I don't think that that is a good workable procedure. But you know, I don't know if anyone has ever tried it. It may work very well.

Mr. ANDREWS. I don't have an opinion about it. I am really asking for yours.

Mr. MANUEL. I don't believe that that is a good—I think that, you know, if we concentrate more or less with our county, within our county, that that is a better—better for us. I think that up the line, it relies upon emergency management, or the EPS to regulate and control that. I would think that is a pretty broad thing. The Governor already has that authority. He can do that right now.

As I said, he can appoint several counties together or appoint several cities together and have interjurisdictional. I think the local people would prefer having their people, that would be civil defense coordinator or director, over their community.

Mr. ANDREWS. Good. And that is our next panel.

Mayor, thank you very much for addressing us this morning. Appreciate your coming.

Mr. MANUEL. Thank you ever so much for allowing me to be here.

Mr. ANDREWS. If we could move right into the next panel, our civil defense folks, and this is the last panel of the day. Our last panel today, composed of two civil defense officials, Mr. J. Fletcher Hickerson, civil defense director of the city of Baytown. Glad to have you today, Mr. Hickerson. And Mrs. Billie Fife, coordinator, emergency preparedness in the city of Pasadena. Billie, appreciate you coming by this morning to talk.

I will welcome you to read your written statement or make any initial comments before we go to the questions. Mrs. Fife, why don't you go first?

STATEMENTS OF BILLIE FIFE, COORDINATOR, EMERGENCY PREPAREDNESS, PASADENA, TEX.; J. FLETCHER HICKERSON, CIVIL DEFENSE DIRECTOR, CITY OF BAYTOWN, TEX.

Mrs. FIFE. Congressman, thank you for having this hearing and for inviting local preparedness officials to participate. We appreciate that very much.

Emergency preparedness, or emergency management, or civil defense is that function of government engaged in a program for prevention of, preparation for, response to, relief and recovery of emergencies/disasters. The chief executive of the local governing body—in this case, the mayor—is responsible for all emergency preparations. As coordinator for the city of Pasadena, I have been delegated the authority needed to develop emergency readiness, working with the heads of key operating departments that have emergency responsibilities. We operate under the authority of applicable Federal and State laws and local ordinances. Responsibility and authority is limited to the corporate limits of Pasadena.

An analysis of specific hazards deemed likely to confront the jurisdiction reveal the hurricane as the threat with the highest probability of affecting the greatest number of citizens and property. Pasadena is some 55 square miles in Harris County with citizens, business and industry vulnerable to all hurricane effects.

During an emergency, key officials exercise direction and control from the emergency operations center. National Weather Service data is our authoritative source for decisionmaking in weather-related emergencies. Information from the National Weather Service is received directly in the EOC by teletype and tone alert weather station monitors. Hard copy SLOSH data and National Weather Service data is also received via teletype from the Texas Department of Public Safety Division of Emergency Management. Phone conferences may be—and have been—initiated by the city or the National Weather Service local office when conditions warrant.

Data received from the National Weather Service is applied to local characteristics and conditions. Recommendations from the National Weather Service are considered. As advisor, or chief of staff to the mayor, we make a recommendation for actions including inplace shelter or relocation of citizens. It should be noted that the National Weather Service advises. The burden for an action decision and direction rests with local officials.

The hurricane rating system, or Simpson Scale, has been in use for a number of years and is one of the planning tools used by local officials as a composite of event. This scale is useful in interpreting storm data and is an integral part of the SLOSH study. I would consider any change here as nonproductive. The National Weather Service added yet another valuable input for local decisionmakers in 1983 by issuing probabilities. Based on the forecast track, probabilities are vital planning data. Timely, accurate information is provided to decisionmakers by the National Weather Service.

Much is to be said for the efforts of area meteorologists for devoting time and energy to obtaining comprehensive knowledge in the area of their responsibility. Knowing first hand the responsible officials—making key contacts. Within this framework, we at the local level are confident that we are provided the best of service from the National Weather Service local office and National Hurricane Center.

I have a deep concern that lack of advance planning and coordination on the part of some authorities causes the Weather Service to inherit harsh judgment as to their performance. Past experience—studies, investigations—reveal problems in the ability of the user to interpolate data provided. Another serious problem, we feel, is the lack of coordination and communication among the different user agencies. We are acutely aware of the effect of other entities planning/lack of planning, coordination/lack of coordination will have on our ability to successfully execute emergency plans. The human element must also be considered.

Many area cities and the National Weather Service conduct intense public awareness programs beginning in May of each year. And as we all know, the season is from June 1 to the end of November. Prestrike information inundates the public ear, yet we all witness the psychological reaction of our citizens. They are all individual decisionmakers and make the ultimate decision.

We must emphasize our objection to any proposal that would close local weather service offices or put private companies in the business of weather satellites. For many reasons we are sure weather data will not be enhanced, and foresee numerous problems.

From a public safety standpoint, it is critical in our opinion to maintain local weather stations. And I would say one thing about the statement that Dr. Neil Frank made, when he did credit locals with good emergency plans. But Congressman, those plans are only as good as the information and data that is fed into them so that we can finally make our decision.

Thank you.

[The prepared statement of Mrs. Fife follows:]

PREPARED STATEMENT OF BILLIE FIFE, COORDINATOR, CITY OF PASADENA EMERGENCY PREPAREDNESS

CD (Civil Defense), EP (Emergency Preparedness, EM (Emergency Management) terms used at the option of a governmental jurisdiction, all having the same meaning. That function of government engaged in a program for: prevention of, preparation for, response to, relief and recovery of emergencies/disasters. The Chief Executive of the local governing body—in this case, the Mayor—is responsible for all emergency preparations. As Coordinator for the City of Pasadena, I have been delegated the authority needed to develop emergency readiness, working with the heads of key operating departments that have emergency responsibilities. We operate under the authority of applicable Federal and State Laws and local Ordinances. (Public Law 81-920, "Federal Civil Defense Act of 1950"; Texas Disaster Act of 1975; Executive Order of the Governor, as amended; Sections 7, 8, and 10 of Article 5890e, Vernon's Civil Statutes, as amended; Texas Disaster Plan; Pasadena City Ordinance, Section 10). Responsibility and authority is limited to the corporate limits of Pasadena.

An analysis of specific hazards deemed likely to confront the jurisdiction reveal the Hurricane as the threat with the highest probability of affecting the greatest number of citizens and property. Pasadena is some 55 square miles in Harris County with citizens, business and industry vulnerable to all Hurricane effects.

During an emergency, Key officials exercise direction and control from the Emergency Operating Center.

National Weather Service Data is our authoritative source for decision making in weather related emergencies. Information from the National Weather Service is received directly in the EOC by teletype and tone alert weather station monitors. Hard copy SLOSH data and National Weather Service data is also received via teletype from the Texas Department of Public Safety Division of Emergency Management. Phone conferences may be (and have been) initiated by the City or the National Weather Service local office when conditions warrant. Major news media are monitored to cross check information released to the public. Data received from the National Weather Service is applied to local characteristics and conditions. Recommendations from the National Weather Service are considered. As advisor, or Chief of Staff to the Mayor, we make a recommendation for actions including in-place shelter or relocation of citizens. It should be noted that the National Weather Service advises. The burden for an action decision and direction rests with local officials.

The Hurricane rating system, or Simpson Scale, has been in use for a number of years and is one of the planning tools used by local officials as a composite of event. This scale is useful in interpreting storm data and is an integral part of the SLOSH study. I would consider any change here as non-productive. The National Weather Service added yet another valuable input for local decision makers in 1983 by issuing probabilities. Based on the forcast track, probabilities is vital planning data. Timely, accurate information is provided to decision makers by the National Weather Service.

Much is to be said for the efforts of area meteorologists for devoting time and energy to obtaining comprehensive knowledge of the area in their responsibility. Knowing first hand the responsible officials—making key contacts. Within this framework, we at the local level are confident that we are provided the best of service from the National Weather Service local office and National Hurricane Center.

I have a deep concern that lack of advance planning and coordination on the part of some authorities cause the Weather Service to inherit harsh judgement as to their performance. (Past experience—studies-investigations reveal problems in the ability of the user to interpolate data provided.) Another serious problem, we feel, is the lack of coordination and communication among the different user agencies. We are acutely aware of the effect of other entities planning-lack of planning; coordination-lack of coordination will have on our ability to successfully execute emergency plans. The human element must also be considered. Many area cities and the National Weather Service conduct intense public awareness programs beginning in May of each year, (Hurricane season—June 1-November 30). Pre-Strike information inundates the public ear—yet we all witness the psycological reaction of our citizens. They are all individual decision makers and make the ultimate decision.

We must emphasize our objection to any proposal that would close local Weather Service offices or private companies in the business of weather satellites. For many reasons we are sure weather data will not be enhanced, and foresee numerous problems.

I'm not sure what really passed through the Galveston and Houston metroplex on August 18, 1983, as our office received a call from a sister city who subscribes to a "Private Service" that Hurricane Alicia would landfall much further south—Corpus Christi.

...FOR INTRAGOVERNMENT USE ONLY ...
TROPICAL CYCLONE DISCUSSION TROPICAL STORM ALICIA
NATIONAL WEATHER SERVICE MIAMI FL
1130 AM EDT TUE AUG 16 1983

ATTN WSFOS NMC F/D

Corpus C to Cearo 15/18

AF RECON REPORTS SHOW THAT ALICIA HAS STRENGTHENED DURING THE MORNING WITH LOWEST PRESSURE NEAR MB. MAX WINDS WERE KTS WITH A PEAK WIND OF 59 KNOTS. SATELLITE LOOPS SHOW STORM WELL ORGANIZED AND CONDITIONS ARE FAVORABLE FOR FURTHER STRENGTHENING.

MOST OF THE NHC COMPUTES MOVE ALICIA TOWARD THE WEST OR NORTHWEST. ALL NMC PROGS ARE NOW SHOWING SLIGHT PRESSURE FALLS OVER THE UPPER TEXAS OKLAHOMA AREA THROUGH THE FORECAST PERIOD. THIS MEANS ALICIA SHOULD TAKE A MORE NORTHWARD TURN. MOTION WILL CONTINUE SLOW AS STEERING CURRENTS REMAIN WEAK.

SHEETS
PRELIM PROG POSITIONS

INITIAL	161600Z	27.0N	92.5W
12 HR VT	170000Z	27.2N	93.0W
24 HR VT	171200Z	27.4N	94.0W
48 HR VT	181200Z	28.0N	95.0W

)))X)X)XXXX)X)X)X)XXXXXX))XXXXXXXX)XXXXXXXXXXXXXX)XXXXXXXXXXXXXXXXXXXXX

ADVISORY NUMBER 4 TROPICAL STORM ALICIA PROBABILITIES
FOR GUIDANCE IN HURRICANE PROTECTION PLANNING
BY GOVERNMENT AND DISASTER OFFICIALS

CHANCES OF CENTER OF ALICIA PASSING WITHIN 65 MILES OF LISTED LOCATIONS THROUGH 7 AM CDT FRI AUG 19 1983

CHANCES EXPRESSED IN PER CENT...TIMES CDT

		ADDITIONAL PROBABILITIES			
COASTAL LOCATIONS	THRU 7 AM WED	7 AM WED THRU 7 PM WED	7 PM WED THRU 7 AM THU	7 AM THU THRU 7 AM FRI	TOTAL THRU 7 AM FRI
TAMPA FL	X	X	X	1	1
CEDAR KEY FL	X	X	X	2	2
ST MARKS FL	X	X	1	2	3
APALACHICOLA FL	X	X	1	2	3
PANAMA CITY FL	X	X	1	3	4
PENSACOLA FL	X	1	2	3	6
MOBILE AL	X	2	2	4	8
GULFPORT MS	1	2	3	3	9
BURAS LA	2	3	3	3	11
NEW ORLEANS LA	3	4	3	2	12
NEW IBERIA LA	7	5	2	2	16
PORT ARTHUR TX	11	3	2	2	18
GALVESTON TX	17	2	1	1	21
PORT O CONNOR TX	12	4	1	2	19
CORPUSCHRISTI TX	4	6	3	2	15
BROWNSVILLE TX	2	6	3	3	14

X MEANS LESS THAN ONE PERCENT

AZAA 00075 RE62 RE63 AZAH DPS
08/17/83 12.47.55

NOAA 00072 INIC AZAA 00242
08/17/83 12.47.39
AFAP MIATCDATA
WHXX41 KMIA 171730
...FOR INTRAGOVERNMENT USE ONLY ...
SPECIAL TROPICAL CYCLONE DISCUSSION HURRICANE ALICIA
NATIONAL WEATHER SERVICE MIAMI FL
130 PM EDT WED AUG 17 1983

ATTN WSFOS NMC F/D

RECONNAISSANCE REPORTS INDICATE THAT ALICIA IS STRENGTHENING MORE RAPIDLY AS CENTRAL PRESSURES DROP. A SPECIAL ADVISORY WILL BE ISSUED AT 2 PM EDT...18Z TO INCREASE WINDS TO 100 MPH AND RAISE TIDE HEIGHTS TO 10 FEET. NO CHANGE IN FORECAST TRACK OR WARNINGS. PREVIOUS

HEBERT

INITIAL	171800Z	26.1N	94.6W
12 HR VT	180000Z	26.3N	95.1W
24 HR VT	181200Z	27.7N	96.0W
48 HR VT	191200Z	29.5N	98.0W

NEW ORLEANS LA	2	3	2	2	9
NEW IBERIA LA	10	3	1	2	16

DDPC WW374 REG2 REG3 AZAH
08/16/83 16.38.25

...FOR INTRAGOVERNMENT USE ONLY ...
TROPICAL CYCLONE DISCUSSION HURRICANE ALICIA
NATIONAL WEATHER SERVICE MIAMI FL
530 PM EDT TUE AUG 16 1983

ATTN WSFOS NMC FZD

AF RECON REPORTS SHOW THAT ALICIA HAS REACHED HURRICANE STRENGTH THIS AFTERNOON WITH MAXIMUM WINDS NEAR 70 KTS AND A MINIMUM PRESSURE OF 997 MB. SATELLITE LOOPS SHOW STORM WELL ORGANIZED AND CONDITIONS REMAIN FAVORABLE FOR FURTHER STRENGTHENING. AN OIL RIG ABOUT 60 MILES NORTH OF THE STORM CENTER IS NOW REPORTING 70 KT WINDS.

MOST OF THE NHC COMPUTERS MOVE ALICIA TOWARD THE NORTHWEST TO NORTH IN LATER PERIODS. NMC PROGS LEAVE UNCERTAINTY AS TO THE EFFECTS OF SUBTLE PATTERN CHANGES OVER THE TEXAS OKLAHOMA AREA WILL HAVE ON FUTURE MOTION. WE WILL GO WITH THE WEST NORTHWEST TO NORTHWEST SLOW MOTION AS APPARENT STEERING MOTIONS REMAIN WEAK.

SHEETS
PRELIM PROG POSITIONS

INITIAL	162200Z	27.3N	93.1W
12 HR VT	170600Z	27.9N	93.8W
24 HR VT	171800Z	28.5N	95.0W
48 HR VT	181800Z	30.0N	96.5W

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

ADVISORY NUMBER 5 HURRICANE ALICIA PROBABILITIES
FOR GUIDANCE IN HURRICANE PROTECTION PLANNING
BY GOVERNMENT AND DISASTER OFFICIALS

CHANCES OF CENTER OF ALICIA PASSING WITHIN 65 MILES OF
LISTED LOCATIONS THROUGH 1 PM CDT FRI AUG 19 1983

CHANCES EXPRESSED IN PER CENT...TIMES CDT

		ADDITIONAL PROBABILITIES			
COASTAL LOCATIONS	THRU 1 PM WED	1 PM WED THRU 1 AM THU	1 AM THU THRU 1 PM THU	1 PM THU THRU 1 PM FRI	TOTAL THRU 1 PM FRI
PANAMA CITY FL	X	X	1	1	2
PENSACOLA FL	X	1	X	2	3
MOBILE AL	X	1	1	3	5
GULFPORT MS	X	2	2	2	6
BURAS LA	1	2	1	3	7
NEW ORLEANS LA	2	3	2	2	9
NEW IBERIA LA	10	3	1	2	16
PORT ARTHUR TX	23	1	1	X	25
GALVESTON TX	35	X	1	X	36
PORT O CONNOR TX	23	1	1	X	25
CORPUS CHRISTI TX	9	5	2	1	17
BROWNSVILLE TX	3	4	2	2	11

X MEANS LESS THAN ONE PERCENT

[illegible] TTTC
08/16/83 17.37.42

254 DPS AUSTIN [illegible]
TO ALL COASTAL JURISDICTIONS

THE STATE EMERGENCY MANAGEMENT COUNCIL HAS MET IN AUSTIN WITH THE GOVERNOR TO BEGIN PREPARATIONS TO COPE WITH HURRICANE ALICIA.

BASED UPON THE SLOSH DATA AND THE NATIONAL WEATHER SERVICE ADVISORY THE FOLLOWING INFORMATION IS PROVIDED TO ASSIST LOCAL OFFICIALS IN ADVISING CITIZENS OF THE NEED TO EVACUATE. THIS IS NOT A PREDICTION OF LANDFALL LOCATION BUT A TOOL TO ASSIST IN THE DECISION MAKING PROCESS.

IF THE EYE WERE TO CROSS 20 MILES SOUTH OF GALVESTON

SLOSH ZONE	ANTICIPATED LANDFALL		BEGIN EVACUATION NOT LATER THAN	
B1	AUG 18	6:00 A.M.	AUG 17	6:[illegible] A.M.
B2			AUG 17	6:30 A.M.
B3			AUG 17	6:[illegible] A.M.
B4			AUG 16	23:30
B5			AUG 17	5:30
BA			.	.
BB			.	.
BC			.	.
C1			AUG 17	2[illegible]:[illegible]
C2			AUG 17	21:30
C3	AUG 18	6:30 A.M.	AUG 17	12:30
CA			.	.
G1			AUG 17	[illegible] A.M.
G2			AUG 17	7:[illegible]
G3			AUG 16	23:30
G4			AUG 16	23:30
G5			AUG 16	23:30
G6			AUG 16	23:30
G7			AUG 17	11:30
GA				
GB				
GC				
F1			AUG 17	[illegible]:30
F2			AUG 17	21:30
FA				
[illegible]				
FC				
[illegible]				
[illegible]				

IF A VALUE IS CALCULATED BUT NOT SIGNIFICANT, [illegible] IS PLACED IN THAT LOCATION.

PAGE 1 OF 2

[illegible] A. [illegible]
[illegible] 16/17[illegible]

Mr. ANDREWS. Thank you, Mrs. Fife.

Mr. Hickerson?

Mr. HICKERSON. The city of Baytown is organized very similar to Pasadena. There are some differences. Baytown has a city council, city manager-type of government. So the city manager is the chief administrator.

Now, the mayor has been designated by the Governor as the director of emergency management in all cities in Texas. This authority has been delegated in writing to the city manager, and the city manager, in turn, has delegated the authority for coordinating the duties of the office of emergency management to the coordinator. And I say the coordinator, because although I am the coordinator, I have two alternates, because there is no one person. So it might be any one of the three of us who actually work in a given emergency.

We have a local ordinance which spells out our way of operation, responsibilities. Certainly the operation in an emergency such as Alicia does not start at the time that we receive hurricane warnings. For the past 10 years Baytown has been active in developing information on the impact of hurricanes in the city. In cooperation with the National Weather Service we have annual hurricane preparedness meetings, and besides the formal conferences, we have dozens of programs each year with city groups in providing specific hurricane information.

Starting in 1974 we have published brochures at local expense on hurricane information, together with maps of elevations throughout the city. I have shown these as an attachment to the report that I have, and I hope that every city in the coastal area would have similar maps. I don't think they do. But it is very important, and I think we will see how important that is. We have updated these annually, and approximately 15,000 brochures have been distributed with the help of industry.

Another very important preparation was the study on hurricane relocation planning which was conducted, and that report went out in 1981, on the Houston-Galveston-Freeport area. This was conducted by Texas A&M under the direction of Dr. Carlton Ruck. This is the report on the sea-lake-overland surges of hurricane, better known as [SLOSH]. That is what most of us call it, the SLOSH report. That report gives detailed information. There are four locations where we have—in Baytown, which gives the storm surge, arrival time of 50-mile-an-hour winds, 65-mile-an-hour winds—very important information.

Now most of Baytown is above the 25-foot elevation and would not be subject to a storm surge even under the worse conditions. But we have adopted a plan which is published in their brochure that those areas subject to flooding would be evacuated according to the specific information from the National Weather Service. This is our published plan. So it is not a matter of whether we will evacuate. We will evacuate those areas according to the information of the National Weather Service. And the matter of timing does enter into it.

Another matter of preparation is the public information emergency service radio, called [PIES]. This is in place in Baytown. In this system, a radio in the emergency operating center, and there are several of them being installed, I think Baytown and Houston are the first ones that were actually operational during the hurricane, we can turn a switch which would activate a monitor in all of the radio and television stations and newspapers in the Houston area. So we can give live information throughout.

We have several ways of getting information from the National Weather Service. We have a teletype on the probabilities and other hurricane bulletins, and the police department. We receive bulletins from the National Hurricane Center directly by radio, teletype in the emergency operating center. We have local statements from the Houston area weather office by our weather radio. We also use the TV weather channel which does give us the ability to get radar, and does have the—every 5 minutes the official National Weather Service messages.

In addition to that we have phone conversations, and it turned out about every 4 hours that I have read of—sometime it is more frequent than that—with the representatives in either the Houston or Galveston office. So our standard operating procedure is that as bulletins are received from the National Weather Service, we make local observations of our tide readings, wind and rainfall. We look at the SLOSH report on the probable effect of specific hurricane conditions in our area, so as to the height of the storm surge and the arrival of the surge.

We did this during Hurricane Alicia. The need for evacuation and action by the public was discussed with the city manager and the city attorney, mainly as to timing and warning. We compared this, we reviewed these with the National Weather Service by phone. Bulletins were issued at least hourly over the PIES/EPS radio system as it went out. So the delay between information and dissemination to the public was immediate.

I have shown in attachments some of the key messages that went out. We started evacuation as I recall as early as Tuesday evening, saying the low area, especially in the Brownwood area, would be, should be evacuated by noon on Wednesday. Then even as early as Wednesday morning we said people up to 8 feet should be required to move to high ground by dark. Wednesday afternoon we changed that to 10 feet. And then in conference with the National Weather Service, around 11 p.m. on Wednesday we changed that to 15 feet as the storm progressed.

I think we have to recognize that each area has its own problems. Baytown is not the same as Galveston, not the same as Pasadena, not the same as Houston or Freeport. But the people in our area need specific information. We think that that local interpretation is very necessary on the decision. We just can't see how that can be made at some location other than where we are. It has to be coordinated with the National Weather Service so that we put out a uniform message to the public.

We would like to summarize our opinion of the National Weather Service. The service was limited by the state of technology and their ability to predict the increase of the storm, the exact time of arrival and the point of landfall. But within these limitations, we think it would have been difficult to improve on the flow of information and the cooperation we got from them. As I said before, this was made possible by the preparation and the relationships and information which was in place before the storm hit. We think this could only be done by one agency giving uniform information. We just can't see how this can be done by somebody at a distant point, or even by the news media, itself.

We have made a comparison with the SLOSH prediction, and we have shown this in our attachment 3. We did not put out SLOSH information to the public. We used that for our own information. We only put out what the National Weather Service made public. But it turned out that we were looking pretty much at the same data. So we had in place knowledge of what was going to happen. It is impressive to us that a system of warning is in place where good information from the National Hurricane Center flows to the local weather office for local statements, and thence to local management's office for specific interpretation, and finally to the media. This kind of system can be in place in areas throughout the country.

We would recommend it—whether it is exactly like we are doing or not—I hope they can improve on our experience. But it does show the importance of having these plans in place ahead of time, and they do work. We had some, around 400 homes were flooded by the storm surge, storm surge of up to 11 feet. It came on quite rapidly. Our warning, we estimate, was about 90 percent. In spite of that, some 100 people were caught by the rising storm surge, and some of those 100 people were taken out. Some swam out, some waded out, some were carried out by the police, some carried on trucks by the public works department. Some were even taken off a roof by amphibious vehicle. But in spite of it we had no loss of life, and no injuries during the system.

We would like to say something about the study of the hurricane rating system. There is a fine line between warning and overwarning. In our areas it is highly industrialized. We must coordinate with industry and their shutting down the plants because they can't operate the plants without people. So we can't tell the people to leave, evacuate the area without shutting down the plants. So it is very important that we give the right information.

When people evacuate unnecessarily, then those who must evacuate cannot evacuate. We saw that in Hurricane Allen. And so this is a very serious problem of walking the line between giving adequate warning and overwarning. We always want to give more warning—we want to feel safe. Now, the Simpson Scale we think is helpful in delineating that the difference between storms are not the same. And the public has to be made aware of this. It is a good shorthand method for describing the various hurricanes and their potential effect and damage.

We have found the scale to be quite useful in giving rapid access to hurricane reports and storm effects. We believe that more emphasis should be placed on the description of the damage by the media and I have attached a description of the damage in there because it does vary according to the storm intensity.

In summary, we think that the preparation is most important. The relationships with the National Weather Service are important before, during and after the storm. And we feel that we are grateful it worked. It was only by the grace of God, however, that we didn't have people that drowned.

Mr. ANDREWS. Thank you, Mr. Hickerson. One of the things that we discussed earlier today was the fact that in this hurricane we were lucky in that it didn't rain as much as we feared it was going to rain. And the storm surge was not as bad as it ended up—as we thought it was going to be. What, in your opinion, and I will address this to both of you, would have happened in Alicia had we gotten the 10 inches of rain, or had the storm surge been several feet higher than it was?

What would have been the consequences to Pasadena, Baytown, and communities on the east end of Harris County?

Mrs. FIFE. Well, Congressman, we would have been in serious trouble. As you know, Pasadena and this total area is in the coastal plains, and we have very little gravity flow. And all of our drainage is affected by the tides. And with the amount of rainfall that would normally, or if we can say there is anything normal about any one hurricane, we would—then our drainage would have been further limited.

And based on our past experience again, we would just have had a tremendous amount of water damage; we would have had hundreds of homes with water in them. As it turned out, the damage from Alicia was wind, and we were confronted with an enormous amount of debris. We had very little structural damage, minor. But with additional water we would be in very serious trouble.

Mr. ANDREWS. Dr. Frank mentioned earlier today his suggestion of vertical evacuation. I wonder if you would comment on that. Will that work for cities like Baytown and Pasadena?

Mrs. FIFE. Not Pasadena. We have one multistory building, so we would be out of that.

Mr. ANDREWS. Which took a lot of damage and would get pretty crowded I guess in a bad storm?

Mrs. FIFE. Sure. That was all glass. I think what Dr. Frank is saying is that you have to look at, and we all agree, you have to look at all the alternatives. Certainly in the case of this storm there were some people who left Galveston and there were some people who left Pasadena. You will always have a percentage that will leave whether you order an evacuation or not. Even the comparison of the 1900 storm and Alicia, if you compare that to Carla, I mean it was the advance warning time. If you had more advanced warning time, because of the type of storm it was, they did their job with the storm we had, but given another type of storm, that was the same intensity once it hit landfall, you would have had that leadtime and you would have had more people leave.

Now, coming down to the line where they are still there, that alternative is certainly better than staying in their homes. Yes, we certainly concur with that, and he is speaking away from the beach areas.

Mr. HICKERSON. I think this points out the fact that each area is different. Vertical evacuation might be useful in Galveston, for example, but it is not universal. And it is a second choice really, and I think Dr. Frank would say that, to getting out of the storm area.

Mr. ANDREWS. Yes. And that is what he did say earlier today.

Mr. HICKERSON. So that each area has to look at its own. We are fortunate in Baytown that we can have evacuation to high area within the city. There are some places that are cut off, but not very many. So that each area has its own problems.

Mr. ANDREWS. Well, and that presents another area I am curious about. That is the coordination between different communities. With the past panel, we were talking about the information flow from the mayor of Galveston to the mayor of Pasadena or Baytown. Is there any coordinated system that we can devise that will enable local officials to make decisions based on better information about what is going on in some of these other communities? Are you satisfied with the communications network between Pasadena and Baytown, or Pasadena and Seabrook, areas like that that are trying to make and grapple with the same kind of decisions that you are trying to make in your area?

Mrs. FIFE. I am satisfied with it between Baytown and Pasadena because we make it a point to communicate. But overall there is not coordinated communication.

Mr. ANDREWS. How can we change that? What needs to be done to improve that? I think that is a serious problem. Would you agree with that?

Mrs. FIFE. Yes, I testified to that. I personally feel that that would have to come beginning with the locals. We talked about a regional person making these decisions, you can't take it away. Those are local decisions, and it is critical that the people receiving that information realize what that data applied to their community will do to it. But once a move is made, yes, everyone needs to be receiving that information. And in this part of the country we have long hoped that this information could be collected at the county level, you know, from the cities to the county, and that each county then would communicate with each other, and then that would be disseminated within the county to the locals. It has to follow a chain, there is no doubt about it.

Mr. ANDREWS. Has it worked that way?

Mrs. FIFE. No, we don't have that chain. I am saying we were hopeful that it would come about.

Mr. HICKERSON. I, too, feel that it could be improved upon greatly. It could be accomplished rather easily. It is a matter of just developing standard operating procedures, and then proceeding with it. The communications, the hardware is in place, the organizations are in place. So it is just a matter of getting procedures and following them. And it is something that we have started on but I think it needs more emphasis, because in an emergency when a hurricane hits, you are thinking about yourself. But you need to have somebody looking over your shoulder to help think about the relationships, also. We don't live by ourselves.

Baytown Tunnel, for example, did shutdown. The tide did come over Highway 146. It did shutdown in order to protect it from flooding. So that means escape was out. We did put out this information, and that kind of information needs to go out. But we also need communication on what the other municipalities and locations are doing. I think it could be accomplished rather easily.

Mr. ANDREWS. You know, one complaint I heard over and over again in visiting with the mayors in my district, and there are many of them, there are a lot of smaller communities in my congressional district that suffered a lot of damage, was that there was a lack of coordination as it related to emergency equipment. One of the mayors needed a generator. His power went out. He had nowhere to call. He didn't know where to go. He didn't sense any inventory of emergency equipment.

Constable Bill Bailey in that constable precinct had the foresight to gather as much big operating equipment, big heavy trucks as he could before the storm hit. But I have not sensed that there is a system, a pooling system where we bring in equipment in anticipation that one of these storms is going to hit. It always seems that there is a lot of guessing about where it is going to go and not enough inventory and coordination of consolidating some of this equipment, where if it hits Freeport instead of Galveston, those trucks and those generators can be moved down there.

But at least there is some sense of inventory where many of these local officials know where to call. That mayor, that particular mayor, it took hours to get that very vital piece of equipment for that city. But I wonder if you all would comment on that. Do you agree with it? If you don't, please give me your thoughts about it.

Mrs. **Fife**. Congressman, there is a system for resource management. And I have to say that in Pasadena we have, at this point in time we have the total cooperation of our administration and the latitude to do our job. And that is not always the case. As I stated in my testimony, I saw this happen after Claudette. HGAC had a hearing. The elected official was not aware of actually, if planning had gone on in his city he may not be aware of it. Now, I am not saying this is 100 percent, but you see this many times.

Are they communicating with their civil defense director or emergency preparedness director, if they have one? If they, in fact, are taking that role as being the emergency preparedness director, have they given it any thought prior to this? That is not the time to learn how to swim, when you fall out of the boat. And I think that is what you are seeing so many times with elected officials, when they tell you they don't know which way to turn for resources and other things is that they haven't given any thought to this prior to that time. Not enough, that is for sure, or they would know what the effects of this storm would do on their area.

Mr. **Andrews**. Mayor Manuel, earlier, said that had he been a brand new mayor, or a new public official without any previous experience he would have been in a terrible situation trying to make those kind of very critical decisions. Do we need some kind of educational program, either presented by the National Weather Service, or should it be locally, to try to educate elected officials on the means that are available, where they go for this kind of inventoried equipment, where they go for help? Do you think local officials have the expertise to make the kind of life-and-death decisions that they are called on to make in these very critical circumstances?

Mr. **Hickerson**. I think that you are really talking about two different things when you are talking about inventory and supplies as against expertise. And I think we need to differentiate.

Mr. **Andrews**. Well, no, let me just—in some of these situations I imagine a mayor wouldn't know where to call. Literally wouldn't know where to go to get a dump truck.

Mr. **Hickerson**. OK. Those, our lines of assistance are through the Division of Emergency Management, which has regional headquarters in Houston for any kind of assistance we need. They do try to have workshops for all new officials in order to plead with them to know how to do those kind of things. Those are frequent. The regional liaison officer I think goes around and visits with them to try to get them to know these channels of assistance.

So far as the—there probably could be some improvement on preplacing inventory and gathering. But the channels are there, and they do work. Now then, as far as expertise is concerned, that is a very difficult job of knowing how to do these things. It does take time to build up the expertise, and there is a certain amount of experience and information that is necessary.

It is difficult to have a new mayor come in and be expected to do all these things. There probably needs to be some help along those lines to help new officials coming in, to know what their responsibility is and how to meet it. I think there is some area there that can be improved.

Mrs. **Fife**. I think that, Congressman, most of these things are in place. But thank God we live in a democracy, and yet our democratic way of life doesn't force anyone to do anything.

Mr. **Andrews**. Let me turn to one other area. And that is the proposed closing of some 269 weather stations, and also the shutdown of 367 weather radio stations, 2 of which serve Houston and Galveston. The Houston Post on August 20 of this year in an editorial strongly urged that this not happen, and made the following statement: "An evacuation over narrow causeways and overcrowded roads is expensive and in itself poses some dangers. The National Weather Service estimates that to evacuate Galveston Island would take 27 hours under normal conditions. Should a meteorologist in Fort Worth make this decision or a machine in Galveston? The United States has built the finest meteorological system in the world. It must not be fragmented or destroyed." Would you concur with that editorial opinion?

Mrs. **Fife**. Totally.

Mr. **Hickerson**. Absolutely.

Mr. **Andrews**. In your view, then, it would be inappropriate to shut down these local stations?

Mr. **Hickerson**. We cannot see how we could have the ability to make the decisions that we have to make, and we think we must make them. We think that nobody but us can really make them for us, if we did not have that advice close at hand. Because there are unusual things that cannot be foreseen. They happen with us. The effects are a little bit different than what we expected, from what the machine says or what they say up there. We have to be able to have that rapid consultation. I think it was successful in Baytown in saving lives because we did have it.

I would be very much against doing away with that. That is a unified authoritative system. There may be others that have the expertise but they don't have the unification that the National Weather Service does.

Mr. **Andrews**. Mrs. Fife, for the purpose of the record, would you concur in that view?

Mrs. **Fife**. Absolutely. You have to have a knowledge of your local, of the local area that you are servicing. That meteorologist does. So, he knows those rapid changes. As you heard, Mr. Harned gave a personal call to Mr. Hickerson.

Mr. **Andrews**. I might add for purposes of the record——

Mrs. **Fife**. Civil defense director, to keep continuity, if you have a new mayor he just keeps the civil defense director.

Mr. **Andrews**. I want to thank you all.

For the purposes of the record and transcript that will be prepared for our committee in Washington, we may submit to you additional questions in the next 10 days or so and ask you to respond in writing to those questions for the purpose of the record.

Mrs. **Fife**. Yes.

Mr. **Andrews**. I appreciate very much your being here.

This hearing will adjourn today. We will meet tomorrow morning. The Public Works and Transportation Committee—the Water Resources Subcommittee—will hold hearings reviewing the FEMA procedures and hear further testimony tomorrow morning.

Thank you very much for appearing, and this hearing is adjourned.

[Whereupon, at 12:50 p.m., the subcommittee was adjourned, to reconvene, subject to the call of the Chair.]

HURRICANE ALICIA—PREDICTION, DAMAGE, AND RECOVERY EFFORTS

SATURDAY, SEPTEMBER 24, 1983

House of Representatives,
Subcommittee on Water Resources,
Committee on Public Works and Transportation,
Houston, Tex.

The subcommittee met, pursuant to call, at 9:20 a.m., in courtroom 2, Federal Building, 515 Rusk Avenue, Houston, Tex., Hon. Robert A. Roe (chairman of the subcommittee) presiding.

Present: Representative Roe.

Also present: Representatives Andrews and Vandergriff.

Mr. Roe. Good morning, ladies and gentlemen.

We want to welcome you to the hearing this morning. The Subcommittee on Water Resources, House Committee on Public Works and Transportation is meeting to receive testimony on damages and recovery efforts associated with Hurricane Alicia.

We are here at the request of our distinguished colleague and member of our committee, Congressman Mike Andrews, and also with his colleague, Tom Vandergriff, our colleague from Texas. Both of these gentlemen, particularly Mike in the leadership he has taken, have done a superb job, in our judgment, in bringing to the attention of the Congress and to our Public Works Committee, the order of magnitude that happened here in Texas, the Houston/Galveston area and surrounding communities. Also, what we should be doing about it.

We mean this hearing to be substantially on the basis of what direction do we take from here, what can we do to be helpful to you now, and what we should be doing down the road.

As you know, Hurricane Alicia came ashore on August 18 with a 119-mile-an-hour wind. Damage estimates range over a billion dollars, making this one of the most expensive disasters in U.S. history.

Regrettably, most regrettably, 21 lives were recorded lost and thousands of families, as you know, were seriously affected. Red Cross assistance was extended to over 16,000 of these good families.

The primary source of Federal assistance, as you may know, in the event of natural disaster is the Federal Disaster Relief Act over which this committee has jurisdiction. Under the act, assistance is available to individuals, including temporary housing, minimum essential repairs to residences, assistance with rental or mortgage payments, unemployment assistance, individual and family grants up to $5,000, and some counseling.

Assistance to State and local governments is also available, including debris clearance. We ought to talk about that a little bit today. And repair and replacement of public buildings and facilities.

The purpose, again, of today's hearing is to examine the effectiveness of existing law in dealing with disasters of the magnitude of Alicia.

We have, therefore, invited local representatives, mayors, and members of the local governments to meet with us and express their views of what really has happened, what is happening in the interrelationship between State and municipal governments, and what we can do further to be of help and to improve the legislative process.

Our first panel of witnesses will consist of Mayor Whitmire of Houston; the city manager of Galveston, Mr. Huffman; and Judge Jon Lindsay of Harris County.

Before we call on those witnesses, I want to defer to our distinguished representatives from Texas. First, the Honorable Mike Andrews.

Mr. ANDREWS. Thank you. Thank you, Mr. Chairman.

It is a real pleasure to welcome you to Houston. Bob Roe is chairman of the Water Resources Subcommittee of Public Works. It is a real honor to have him here today.

He also, along with myself, serves on two committees that are concerned about Hurricane Alicia, the Science and Technology Committee and the Public Works and Transportation Committee.

These hearings started yesterday, and will end today with our—both committees' overview of the problem. So it is an honor to have such a distinguished Member of Congress here with us today, and my freshman colleague, Tom Vandergriff from the Dallas/Fort Worth area has kindly come down to help us today in reviewing these problems that certainly don't just affect our area, but the Dallas/Fort Worth area, as well.

Hurricane Alicia has had profound effects on many lives on many of us. As a result, it has triggered a strong and very diverse response from the Federal Government.

I think it is appropriate that we take the time to look at how well these programs have worked and where improvements can be made in the future. Hurricane Alicia was a serious hurricane. We should not forget the extent of the damage our community sustained.

I think one of the things the testimony revealed yesterday is how blessed our area really was as a result of this hurricane, and how much more difficult and dangerous the problems could have been.

It is just a matter of time before we have a hurricane that is rated a four or a five, rather than a three, as Hurricane Alicia was. I am concerned about this, as I know all Houstonians are.

Today we will be hearing from the Federal Emergency Management Administration, which is charged with delivering to the local communities all the Federal aid available after a weather disaster.

We will be talking with a number of our local mayors and exploring the myriad problems they have experienced with Alicia and its aftermath.

We will also look at the experience of the local Red Cross, Houston Lighting & Power, and the State of Texas in dealing with the devastation of property and life created by Alicia.

Without any further statement, Mr. Chairman, I suggest we proceed.

Mr. ROE. How about the gentleman from Texas, Mr. Vandergriff?

Mr. VANDERGRIFF. Mr. Chairman, allow me to say very briefly that I am delighted to be here. I have boundless regard for Mr. Andrews.

He is performing yeoman service already in the Congress. I think it is worthy of commendation that he is so responsive as to wish these hearings to be held.

Mr. Chairman, I thank you, too. As a fellow Texan of Congressman Andrews, I am grateful that you would join us. You have so many demands on a national scale, for that matter, and the fact that you would come here speaks well of you.

I want to say on behalf of all north Texans that we recognize the tremendous burdens placed upon this great region of yours, Congressman Andrews.

I trust that we were compassionate neighbors, as south Texans have been in instances affecting our region of the State. We are anxious to learn here today, to gain from this tragedy so that we might better react in future instances, and with particular regard to that goal of ours, I have asked Mr. Sabota, from the Small Business Committee staff in Washington, to my right, to sit in on these proceedings today.

I happen to be a member of the Small Business Committee, as well as Public Works, and Small Business, naturally, has a vital interest in responses to disasters such as you have experienced.

So we look forward to a real learning experience here today. Thank you, Mr. Chairman.

Mr. ROE. Thank you, Tom.

Our first group of witnesses, so we can move right along, will be in a panel including the distinguished mayor of the city of Houston, the Honorable Kathy Whitmire. With her will be the city manager of the city of Galveston, Mr. Steve Huffman, and joining that panel will be the Honorable Jon Lindsay, county judge of Harris County. Then, also on that panel is the Honorable Harvey Petree, mayor pro tem of the city of Deer Park, and the Honorable Alan Cannon, mayor of the city of Baytown.

We will take everybody together, so you can come up, get a chair and sit down.

Mr. ANDREWS. Mr. Chairman, I understand that Judge Jon Lindsay is ill today and Perry Simmons, his administrative assistant, is here in his place.

Mr. ROE. Mr. Simmons will be representing Judge Lindsay.

I think we would want to welcome the most distinguished member of the great city of Houston. When I came here, I came from the airport and looked down over the city of Houston, and saw this magnificent center rising here in Texas.

It seems to be growing in every direction. It did remind me a little bit of my eastern section of New Jersey, New York, where we are reaching to the skies, too.

So we are very interested. We know of the job you are doing, great job, as mayor of the city. We would like to call upon you first.

The full text of your prepared statements will appear in the record at this point.

[Statements referred to follow:]

STATEMENT OF MAYOR KATHRYN J. WHITMIRE OF HOUSTON

I very much appreciate the opportunity to appear before you today to discuss the effects of Hurricane Alicia on the City of Houston. This major event put Houston in the unique position of being declared a disaster area.

Alicia has affected us all, and it is an event that many will not soon forget. It has brought us all together and tested the effectiveness of all levels of government working with citizens to recover from the most damaging natural occurrence in our lifetime. Houston had never before experienced massive loss of water and water pressure, electrical and phone services, traffic signals and signs; flying glass downtown and in other areas, with many broken windows; the loss of thousands of trees with an estimated accumulation of at least two to three million cubic yards of debris littering yards, streets, and parks. Never in Houston's history have so many individuals, in the span of a few hours, found themselves without water, electricity, and phone service, as well as suffering damage to their homes and property. Many people were stranded in their homes, unable to leave. It was a frightening and extraordinarily inconvenient experience for so many of us, and it continues to be a massive recovery effort for us all.

I called a meeting on the morning of August 17th of emergency personnel to assess the degree of storm preparedness. The storm was monitored throughout the night by all emergency personnel, specifically, Civil Defense, Police, Fire, Traffic & Transportation, Health, Aviation, and Public Works. I arrived at Civil Defense headquarters at about 6:00 a.m. on the 18th to find that city employees had established a smooth network of communications to monitor the storm. Both airports were closed and Aviation employees had secured the facilities; Wastewater and Water crews were on standby to continue the provision of utility services; and, Police and Fire employees continued to respond to calls for assistance.

During the storm, windows began to break in downtown buildings, and broken glass became airborne in the area, creating an extremely hazardous situation. We learned that we were experiencing power failures and that downed trees were blocking streets. At a little before 7:00 a.m. I cautioned citizens, through the media, not to leave their homes and ordered the downtown area closed to both pedestrian and vehicular traffic.

After the storm had passed, we surveyed the immediate damage. Broken glass littered downtown streets. The Police responded immediately to block off a portion of the downtown area, and it remained cordoned off until the evening of the 21st. In three days, downtown building owners finished clearing broken glass and debris and boarded up the windows. City crews cleared the streets of shattered glass, while Police continued to keep the area secured. The prompt response to both City crews and building owners enabled the downtown to be completely open for business on Monday, August 22.

Due to failure of electrical power necessary for the operation of the City's water pumping stations, virtually the entire City water system was down after the storm. By the afternoon of the 19th, with tremendous cooperation from Houston Lighting & Power, Public Works employees had restored water service to about 70 percent of the City. Crews continued to work around the clock during the weekend to achieve 100% restoration of water service and normal water pressure by the evening of Sunday, August 21. It was determined by Monday, August 22, that continuous pressure had been maintained in the water system so that no contamination of the water supply had occurred.

A majority of City streets and thoroughfares were made impassable at points by tree limbs and other wind-blown debris. City Public Works and Parks crews began cleaning debris from the streets as soon as the storm subsided. Within 24 hours most major thoroughfares were open and by Monday, August 22, after working all weekend, nearly all the City's streets were passable.

A total of 1501 signalized intersections required some attention due to the storm, mostly due to power failures. Within a few days of the hurricane, four-way stop signs were placed at 291 intersections with non-functioning signals. Most signals were returned to normal with the restoration of electrical power. In the five day period following the hurricane, 2043 work orders for damaged traffic signs were taken, approximately twice the normal amount.

The immediate response of City personnel was tremendous. In addition to the efforts in restoring water service, traffic flow, and returning the downtown area to normal, other emergency efforts continued. Despite power outages at seven of the City's nine public health clinics, over 90 percent of the City's supply of vaccine was saved (value of $250,000), and scheduled immunization clinics were conducted on Saturday, the 20th. By Monday, August 22, all but one of the clinics were reopened to the public. Emergency surgery continued throughout the storm at hospitals in the Medical Center because the City was able to supply emergency pumps to keep flood waters away from generators supplying electrical power.

The Police Department took 22,290 calls during the three-day period beginning at 6:00 a.m. Wednesday, August 17, and ending at 6:00 a.m. on Saturday, August 20. By comparison, during the same period of the preceding week, calls numbered 14,340. The day of the hurricane, the Police Department responded to almost twice the usual number of calls. In addition, patrols were increased to prevent looting of damaged retail areas, and officers were stationed downtown to maintain a secure area.

Fire personnel responded to 502 calls on the 18th, a 325 percent increase over the previous Thursday. Approximately 225 of the calls were in reponse to downed power lines or electrical shorts. For the Week of August 18 through August 24, the Department responded to 1,863 calls, or 144 percent more than the previous week. During the storm, approximately 40 people were rescued or evacuated by department personnel using airboats or other City equipment.

Ambulance calls also increased on the 18th—by 41 percent from the previous Thursday, or 340 calls. The weekly figure was up 15 percent to 1992 runs.

A field inspection force of 40 Health Department employees was placed on emergency standby on the 17th. From the 19th through the 26th, field inspectors, supervisors, and an emergency team of 24 sanitarians inspected more than 3000 food establishments. Inspectors condemned 1,871,400 pounds of food as being unfit for human consumption, and an additional 3,700,000 pounds of food were quarantined awaiting separation, condemnation, and disposal. Most food spoilage resulted from improper storage temperatures due to power outages. Food contamination at retail outlets and restaurants was also caused by flooding and leakage due to structural damage. 126 food establishments were required to temporarily cease operation.

Food spoilage also occurred in citizens' homes due to power failures. Many citizens lost valuable food, which was placed at the curb for collection by the City. The Solid Waste Department, in addition to losing the 18th as a collection day, was now faced with four to five times the amount of garbage collection at most points of pickup. Solid Waste crews have worked since the storm at increased levels in an effort to maintain this basic City service on a twice-weekly basis.

These efforts were conducted on the day of Alicia and the days immediately following the storm. In addition to these departmental efforts, I created a task force of departmental personnel administered by my staff to oversee the long-term recovery efforts. Through this activity, seven debris collection sites were set up and run by City personnel on City property within days after the storm. The task force, along with assistance from City Council members through a specially called briefing on the 19th, had quickly assessed that a united effort by citizens and government was necessary for this recovery. Citizens have cooperated tremendously, bringing over 400,000 cubic yards to the collection sites since the storm.

Work was conducted over the weekend of the 20th and 21st to prepare for a special session of City Council to approve specifications for debris collection contracts. The contracts, totalling $2,000,000, were awarded on Wednesday, August 24, with crews on the streets in a record six days following the storm. Another round of contracts was awarded on September 7th, for a total of $3,000,000. To date, these contractors have picked up and disposed of well over ½ million cubic yards of debris, with a small amount being removed from collection sites.

We quickly realized that storm debris collection would constitute the greatest long-term, concentrated effort on the part of the City. Many projects were undertaken to supplement collection site and contractor efforts. City crews continued to pick up debris while the City of Dallas loaned crews to assist us. Dumpsters were provided by Browning Ferris Industries, the Texas Department of Corrections provided assistance, and the City's Adopt-A-Truck program was stepped up whereby civic organizations are provided City equipment to clean their neighborhoods. These efforts have resulted in the collection of over 50,000 cubic yards of storm debris.

Representatives from the Federal Emergency Management Administration have worked with us daily since the storm, providing administrative assistance in the recovery efforts. FEMA was on hand the weekend after the storm to provide damage estimates. Total estimated damage in the City runs over one million dollars. City government was faced with an initially estimated three million cubic yards of debris, $2 to $4 million in damage to City facilities, and an additional $18 million in administrative expenses and damages which are not reimbursable. Included in this amount is an estimated $14 million loss of trees in City parks.

The City continues to work with FEMA to provide proper accounting for reimbursable expenses. FEMA staff have assisted City staff on an on-going basis to develop such items as specifications for the second round of contracts and an inspection system for contractors. They have always been responsive to our suggestions for recovery programs, offering us their experienced assistance in disaster management. FEMA staff have always been available when needed and have attended our staff meetings. Our damage estimates were conducted quickly, and 50 percent of the 75 percent of the estimated $11 million in reimbursable expenses, or $4.3 million was received by the City on Thursday, September 22nd.

The responsiveness of FEMA, City employees and our citizens in dealing with the aftermath of Hurricane Alicia has been tremendous. With all units of government working with citizens and civic organizations, we should soon no longer encounter the effects of the storm each day as we drive our City streets. Many individuals, particularly our City employees working with FEMA representatives, have made incredible efforts to fast track clean-up and recovery operations outside of their normal work loads. Many are unaware of these efforts so many individuals are making in addition to the usual delivery of City services.

I have detailed for you only those effects which have been documented as functions of municipal government. Statistics and words cannot illustrate adequately the resilience displayed by thousands of Houstonians. We have learned a great deal in the aftermath of Alicia: We have learned that we were prepared and can mobilize to quickly restore vital City services; that the citizens of Houston did draw on a strong sense of community to help themselves and each other through the tedium of sustained power and phone outages; and that essential recovery could be accomplished in a short amount of time.

All of us want to see the City free of debris and back to normal, but we also realize that we survived a devastating natural phenomenon. Total recovery will not come overnight, nor will it be easily accomplished. We are sustained in our effort with the knowledge that Houston will recover, and that we will have survived a test of nature—and patience.

I thank you for your concern for our City, and for inviting me to give testimony to important representatives of our government.

City of Galveston,
Office of the City Manager,
Galveston, Tex., September 24, 1983.

Hon. Robert A. Roe,
Chairman, Subcommittee on Water Resources of the Committee on Public Works and Transportation, House of Representatives, Washington, D.C.

Subject: Damages and recovery efforts associated with Hurricane Alicia.

Dear Chairman Roe: On behalf of the Mayor and City Council of the City of Galveston, please accept our sincere thanks for permitting us the opportunity to testify before your subcommittee on the damages and recovery efforts associated with Hurricane Alicia.

Hurricane Alicia was a slow developing storm which only gave us approximately three hours to prepare for the brunt of the storm. The Galveston National Weather Service did an outstanding job and played a major role in protecting the lives of Galveston residents. The personnel at the Weather Service were extremely knowledgeable, cooperative, and professional. It is our hope that the plans to move the Galveston National Weather Service to Alvin, Texas is not implemented. A Weather Service Bureau on the Island is essential, especially during hurricane season.

There were no storm related deaths in the City of Galveston, however, destruction was city-wide. My staff's current storm related damage assessment is as follows:

	Millions
Commercial damage estimate	$355
Residential damage estimate	314
Total	669
City public property damage estimate	9.4

	Millions
University of Texas Medical Branch facilities	[1]

[1] $7 to $9 million.

Destroyed housing units

Single-family homes	1,062
Mobile homes	764
Apartment units	262
Total	2,088

Housing units receiving major damage

Single-family homes	6,750
Mobile homes	443
Apartment units	785
Total	7,978

DISASTER RELIEF CENTER

The Federal Emergency Management Agency was in Galveston two days after the storm to set up a Federal Disaster Relief Center for the citizens of Galveston County and to assist officials at City Hall. They were very well organized and extremely helpful. The City of Galveston provided our only Civic Center Auditorium for the Federal Disaster Relief Center. The Civic Center is managed by our Park Board of Trustees and were extremely cooperative in providing this facility. It is the feeling of staff that some reimbursement of extraordinary expenses in regards to providing disaster relief center should be included in the reimbursement of 75 percent.

DEBRIS CLEARANCE

Federal officials and the Corps of Engineers were very helpful in assisting my staff with developing debris clearance bid specifications and contract awards. It did take a little time to develop the bid specifications and caused us some delay. It would be extremely helpful if FEMA could provide at least the guidelines in advance so that we may get started in the process of developing debris clearance bid specifications so that they may review and have the bid awards as soon as possible. If the criteria regarding the debris clean-up bid specifications should change at any time during the year, then FEMA should be responsible for providing that information to the local government in advance. Therefore, it would give the local government the opportunity to have some guidelines in advance and have the preparation done by the time that the FEMA officials arrive on the scene shortly after the disaster.

DAMAGE SURVEY REPORTS

The FEMA officials preparing the Damage Survey Reports were extremely thorough in their investigations. However, some of their restoration cost estimates particularly in the area of street reconstruction seems to be very low in most cases. It is understandable that some of the streets were not in the best condition or had deteriorated to some degree before the storm. But even with that taken into consideration, the cost estimate seems low because the materials necessary to reconstruct the streets in Galveston are higher than they are in some areas. The FEMA officials and the Corps of Engineers should take into consideration, the cost of doing the reconstruction in the area in which it is to be done. In other words, maybe the higher cost of transportation in obtaining these materials.

PERCENTAGE OF REIMBURSEMENT

As with most cities, our city is faced with serious budget shortfall, which makes the 25 percent local contribution to disaster recovery almost impossible. In January, 1979, local residents imposed budget limitations which makes it almost impossible just to keep up with inflation. On our island, over 45 percent of the property is tax exempt, which represents primarily federal, state, county and local properties. Therefore, it is our suggestion that the committee look at increasing the present 75 percent FEMA reimbursement to possibly 95 percent reimbursement for certain cities in certain cases. The consideration could be used by a formula method on amount of federal, state, county and local government entities that cause such a high tax exempt situation.

RECOVERY TASK FORCE

Approximately five days after Hurricane Alicia hit the City of Galveston, the City Council appointed a Recovery Task Force. This Task Force is made up of twenty individuals. The committee was divided into subcommittees in areas such as construction moratorium and controls, price freezing, temporary housing, utility restoration, health and emergency, medical, west-end blockades and curfews, beach and dune issues, federal and state assistance, financial impact, communications and civil defense, shelters, evacuation and return, insurance settlements and maintenance, relief needs, and return to normalcy. The committee met everyday at 7:30 a.m. for one hour for the first two and one-half weeks after the hurricane. Since then, it has met two days a week at 7:30 a.m. for one hour. This committee has made recommendations and changes in the building code and zoning areas. These recommendations have been submitted to the City Council and Council has taken the necessary action to implement the recommendations.

The long range responsibility of the Recovery Task Force is to develop some mitigation procedures. A proven effective approach to manage anticipated development to insure safe, efficient use of Galveston resources is to prepare a development management system based on carrying capacity analysis. This development management system based on carrying capacity analysis. This development management system should take into consideration in future developments: (1) limited water supply, (2) ability of soil to absorb waste, (3) capabilities of traffic and evacuation, (4) availability of land, (5) environmentally sensitive nature of the island, (6) limitations on multihazard areas. The FEMA officials could play a very important role in the development of this management system. If the FEMA officials were made available in the mitigation process to advise, particularly, with their experience and expertise, in developing this management system, it would be very worthwhile. Another area that they could be most helpful is when the City of Galveston or any other city for that matter, is developing a particular facility such as a sewer plant, fire station, or whatever, in a flood plain, FEMA could be called on to advise us in the mitigation of hazards, such as waterproofing of the facilities and the safeguarding of those facilities for future hazards.

FEMA should arrange to hold training sessions for the federal agencies which normally support the Damage Survey Report (DSR) process. It is apparent that many federal agencies involved in the DSR process are not fully aware that mitigation measures can be proposed in addition to what is normally considered eligible work to restore the facility or structure to pre-disaster conditions. In many cases, these mitigating measures (flood proofing) can be funded up to 15% of eligible DSR work.

The responsible hazard mitigation team agency person should arrange to identify people who will normally be asked to support public assistance DSR activities. These people will then be given comprehensive training to include identification of alternate construction practices, flood proofing, "no action," recommendations, etc.

FEMA-RECOMMENDED CHANGES

Staff recommends favorable considerations for the provision of technical assistance to cities to study indepth recommendations made by the mitigation team. So often the mitigation team identify problem areas whereby local government neither has the expertise to explore further or has the financial resources to hire outside experts to develop a solution.

Another request to Congress regarding possible changes is that for individual projects under $25,000 should be a direct grant provided to the City rather than the present required damage survey reports, support documents, and audit requirements. It would be more cost effective if the present procedure was waived.

CLOSING

In closing, let me reiterate my sincere thanks to you and your subcommittee for permitting me to testify today. I trust that my comments are taken on a positive manner because overall FEMA officials have been extremely helpful.

With kindest regards,

STEPHEN N. HUFFMAN, *City Manager.*

STATEMENT OF COUNTY JUDGE JON LINDSAY

Mr. Chairman, members of the subcommittee, and distinguished guests, I appreciate the kind invitation to appear before your subcommittee today to offer testimony and make comments associated with Hurricane Alicia.

I would begin by setting the historical perspective for the upper Texas coast with certain hurricane facts which are superfluous to the Congressmen from Texas.

On the average, a major or extreme storm hits the upper Texas coast (Pt. O'Connor to Pt. Arthur) about every ten years. Including Hurricane Alicia, nine have struck this coastline in this century, with winds above 100 mph and tides 10 feet above mean sea level. Four major storms occurring include the 1900 and 1915 storms, Carla in 1961, and Alicia. The Great Galveston Storm of 1900 stands as the worst natural disaster in the Nation's history. The more than 6,000 lives lost on that occasion represents more deaths than all hurricanes in the United States in this century.

The upper Texas coast is one of the most vulnerable areas in the United States for a hurricane disaster because so many people live at low elevations and may have to drive more than 25 miles on crowded roads or freeways to a safe elevation; approximately 500,000 live below the 20-foot elevation in the Galveston Bay area alone. Some of the highest storm tides on record in the United States occur with hurricanes in this area. This is primarily due to the shallow rise of the sea floor towards the coastline allowing storms to push tidal waters up on the beach and to the configuration of the coastline, where wind-driven storm tides pile even higher in the bays. Most storms pack tidal waters 50 percent higher in the upper reaches of the bays than along the immediate coast. All major storms that affect this area push tides 10 to 15 feet above mean sea level, and occur about every 25 years. Hightide situations are aggravated by the runoff effect of rainwater draining out of the flood plains, bayous, and bays.

The main killer with hurricanes is the high storm tides. National weather records show that approximately 9 persons out of 10 that lose their lives are drowned in tidal waters. Subsidence has been more severe in the Galveston Bay area over the last several years than any other place in the hurricane belt. It has lowered some land elevations as much as 10 feet, near Galveston Bay and along the Houston ship channel. Rising tide waters can quickly cut off escape routes along low road elevations. Most of these routes are lower than 8 feet above mean sea level and many are below 5 feet. If evacuation is not begun early, more than 100,000 persons could be trapped when tides reach these levels.

Dr. Carlton Rush of Texas A&M developed in 1981 a storm surge model which formulated evacuation plans based on varying storm characteristics. For example, a hurricane due south of Galveston 250 miles away moving due north at 5 miles per hour with 120 m.p.h. winds would require that evacuation be started in Galveston 30.5 hours before landfall.

Responding to these facts, the Harris County Commissioners Court by official order, dated September 29, 1966, established a Harris County plan for emergency preparedness. This emergency operations plan (EOP) described the organization, facilities, and techniques for effectively providing for disaster emergency services for Harris County and the steps to implement the requirements of Federal, State, and local laws relating to disaster situations. The plan is revised and updated yearly.

The focal point of operations in an emergency is the R. E. Smith Operations Center at 330 Rusk Avenue, Houston, which serves as a joint venture for the city of Houston and Harris County's response efforts.

On Wednesday afternoon, August 17th, the day before Hurricane Alicia's arrival, Mayor Kathryn Whitmire called an emergency conference at the Emergency Operations Center to discuss the state of readiness for the hurricane. Major department heads (the police chief, the fire chief, the public works director as well as key defense leaders) were in attendance. Every facet of preparedness including the availability of personnel and equipment and areas of responsibility were explored and reviwed. My administrative assistant, Mr. Perry Simmons, represented the county to report on Harris County's actions to attain full emergency condition. Harris County's main concern was the expected flooding in our 19 watersheds. Our county flood control district was activated on emergency status and had disbursed personnel and equipment to key areas to monitor flood conditions. Every key department responsible for the protection of life and property were placed in a state of emergency.

I will omit details of the actual event which have been well publicized. Assistant Director of Defense and Disaster Relief John Caswell subsequently reported to me the commendable fashion in which the Emergency Operation's Center performed during the emergency. At this point, we have not discussed in depth any improvements or recommendations that should be incorporated into our emergency plan as a result of the Alicia experience. I was well pleased with all county departments that responded, under trying conditions, to alleviate the effects of the disaster.

My office wired Gov. Mark White on August 18th asking that he request a Presidential declaration for Harris County as a disaster area as a result of damages incurred from Hurricane Alicia. FEMA and State emergency personnel began to arrive even before the Presidential declaration became official. On August 24th, FEMA and State emergency officials called a meeting at which they outlined the procedures to be followed by counties, cities, villages, and nonprofit organizations in estimating damages and seeking reimbursement. They announced that three disaster relief centers would open the next week to process claims for individuals and that FEMA, SBA, IRS, and other Federal-State agencies would be present to assist them.

Harris County suffered immense damage throughout the county but the major impact was concentrated in the northeast, east, and southeast portions—those areas lying adjacent to Lake Houston, Galveston Bay, and the Houston ship channel. The most serious blows were incurred at our major parks in those areas—Deussen, Sylvan Beach, and Clear Lake—where extensive tidal effects caused structural damage to piers, bulkheads, and recreational buildings. Widespread debris damage from high winds was prevalent in all areas. Rainfall and flooding was much less than anticipated. A very serious situation was narrowly averted on the San Jacinto River where barges broke their mooring and threatened to destroy the I-10 bridge over that waterway. Two barges came to rest against the eastbound lanes of the bridge and ships were aground on top of Market Street that runs parallel close by. This points out the necessity for the U.S. Coast Guard to develop a contingency plan to move these vessels to other areas during hurricane situations. Not only is the Interstate 10 a major Federal highway but it is the main evacuation route of Baytown and other East Harris communities in times of emergency.

Major debris damage was incurred in all county parks and they have been closed to the public pending clearance of those areas.

Harris County began its debris clearance efforts immediately following the passage of Alicia. Each precinct began making damage estimates for debris clearance and structural damages to facilitate a damage survey summary to the Governor's Office of Emergency Management. This summary was sent to them on August 31st and our preliminary estimates totaled over $33 million to public facilities.

FEMA and State officials have worked very cooperatively with us in our recovery efforts. Our top priority was focused on debris clearance from county roads and bridges as well as from flood control facilities. Our cleanup operations are being done with our own personnel on a time and materials basis which necessitates the leasing or rental of certain equipment to do the work. FEMA, considering the magnitude of the disaster, has done a favorable task in supplying the disaster survey teams to compile the reports necessary toward seeking reimbursement. The Corps of Engineers has been of great assistance to our county personnel. The county has furnished its own dump sites and conducted its own burning operations at no expense to the Federal agencies. While we have had some disagreement with FEMA over the methods used in debris clearance, I think we are both pleased with the progress made. County officials estimate that, at this time, we have completed 95 percent of debris removal throughout the county, excluding our parks which we intend to clear mainly on a contract basis. The damage survey reports on structural damages has proceeded at a much slower pace. We currently estimate that approximately 20 percent of that type has been completed.

At this point, I would like to emphasize the invaluable contributions made by the national weather stations at Galveston and Alvin during the Hurricane Alicia experience. The skills and dedication of those involved at these locations cannot be applauded too highly. I would invite your attention to a recent report done by the consulting firm of Booz, Allen, & Hamilton for the National Oceanic and Atmospheric Administration which deals with certain needs and projection for that agency over the next 20 years. While I have not seen the report, it is my understanding that the 18 existing Weather Service facilities in Texas could be reduced to 2, possibly to be located in the Fort Worth and San Antonio areas. I would be vehemently opposed to such a plan becoming a reality because of the serious ramifications it would have on our ability to protect life and property in such a hurricane prone area. Certainly the input of local and congressional officials should be utilized in any decisions affecting the Galveston and Alvin stations.

HARRIS COUNTY DEFENSE and DISASTER RELIEF,
R. E. (BOB) SMITH EMERGENCY OPERATION CENTER,
Houston, Tex., September 21, 1983.

Judge JON LINDSAY.

At this time a tropical disturbance is reported in the Caribbean we begin daily conversation with the National Weather Service, Houston area office via telephone as to conditions and what is to be expected. This enables us to more expediantly advise the public through the news media. We are advised of inclement weather via telephone before the information goes in the weather wire.

Here in the Emergency Operation Center along with the weather transmitter we have the weather radar through the Houston area office. This greatly enhances our capability of advising the public sooner. Closing the Houston area office would be the worst possible act that could occur. This would further endanger the lives of several million people.

JOHN CASWELL,
Assistant Director,
Civil Defense Department.

STATEMENT OF HARVEY PETREE, MAYOR PRO TEM, CITY OF DEER PARK

The City of Deer Park is very pleased with the initial reaction of FEMA and other agencies involved in the storm disaster cleanup and rehabilitation process.

Within three days of first contract, federal agencies were in Deer Park performing their duties. They worked Saturdays and Sundays and late hours in a very professional manner in trying to expedite the paperwork necessary to help with the cleanup and rehabilition after the storm. We can only hope that followup on the paperwork is expedited in a very speedy manner and that payments are forthcoming in the very near future. This will help the municipalities offset the tremendous cost of rebuilding and cleaning up after a major disaster such as Hurricane Alicia.

STATEMENT OF ALLEN CANNON, MAYOR, CITY OF BAYTOWN, TEX.

Mr. Chairman and members of the Subcommittee on Water Resources, thank you for providing me the opportunity to appear before you and testify on the damages incurred by the City of Baytown and our recovery efforts associated with Hurricane Alicia.

Hurricane Alicia arrived in Baytown on the morning of August 18, 1983. This hurricane, the most devastating ever to hit Baytown, left its mark in damages and lessons learned. The cleanup still continues as I talk with you today and promises to be a long and difficult task.

To enable you better to understand the extent of the damage in Baytown, allow me to give you a brief description of my City. Baytown is a City which comprises 30.1 sq. miles, a residential population of over 59,000; it has a large industrial district made up of Exxon Chemical, Gulf Chemical, Mobay, Stauffer, U.S. Steel and others. Baytown has over 4,500 other small businesses. Its school district is made up of two Class 5A high schools, six junior schools, and 13 elementary schools. Baytown has over 16,000 single-family dwellings and over 6,000 multi-family dwellings.

Hurricane Alicia left a dollar damage figure in Baytown of more than $60 million. The Brownwood Subdivision was devastated by the storm. Three hundred homes in what we are now calling the Brownwood Hazard Area were, in our estimation, totally destroyed. Throughout the remainder of the City an additional 576 homes were damaged or destroyed. Approximately 228 apartment units were effected. Over $10 million in damages were incurred by Baytown businesses which includes $2 million in damage to our new shopping complex, the San Jacinto Mall. The school system received damages totaling $1,700,000. And finally the City's facilities itself received considerable damage.

The Federal Emergency Management Agency held meetings with municipal officials on August 24th to explain their public assistance programs. This was one week after we had begun our cleanup and repair efforts. Following this meeting, damage survey teams from various agencies arrived in our community to complete public assistance damage survey reports. They finished their inspections on the 15th of September.

These reports covered damages to our utilities, buildings, streets, parks, and the costly debris cleanup. It is presently estimated by these reports that we sustained over $1.1 million in damages. This figure excludes the costs associated with the Brownwood subdivision.

The Brownwood subdivision on Brownwood Hazard Area is in many parts below sea level and its underground utilities are inoperative or unsanitary. The inner streets were covered for days by water and the road bed which they rely on for support has surely deteriorated. The perimeter road which serves as a dike around the homes has received wash effects from the storm. In addition, there is a tremendous debris clearance problem which is magnified by the abandonment of properties in this area. The FEMA officials have not, at this time, indicated the total amount of support the City of Baytown can expect to receive in this one area. There has been discussion that the City may receive federal assistance to remove debris from the homes down to the slab on a 75/25 sharing basis. This discussion is promising but does not go far enough. The City needs help also in removing the slabs. Using a conservative figure of one thousand dollars per slab, the cost of slab removal in the Brownwood area will be $300,000.00. This commitment is necessary if we are to insure the safety and health of our own citizens and return the Brownwood area to a natural state.

Even though the Brownwood Hazard Area remains a problem with very little visible progress towards cleanup other portions of the City cleanup effort have progressed very well.

The debris cleanup effort has made tremendous strides. Our City Engineer estimates that we had over 300,000 cubic yards of debris to remove from streets and street rights of way. Inspectors from the Army Corps of Engineers felt that figure was conservative. After four weeks the City of Baytown has nearly completed all street and street right of way debris removal. This has been accomplished using our own employees and outside contractors. We feel that our operation has efficient and cost effective. It is estimated that our costs will remain below $3.00 per cubic yard for removal and disposal combined. Field Inspectors from the Army Corps of Engineers have complimented our staff on their efforts and management of the debris cleanup effort.

Presently, we are occupied in the clearance of debris from our parks. The City of Baytown has 33 parks covering 380 acres of public property. Many of these parks were heavily wooded and will take a century to recover even if we were to start today on a restoration project.

The rules governing FEMA public assistance do not provide for the revitalization of parks property. There are no provisions for the type of extensive tree planting required to reestablish the beauty of our forests. The City of Baytown would welcome any assistance available from other federal services, such as, the U.S. Forest Service to support and compliment our efforts to return our parks to the condition they were in prior to the storm.

Throughout our parks, we estimate over 205 pines and oaks were lost. Replacement of these trees will take decades given our restricted financial situation, therefore we request any available assistance in the form of grants for three planting in our public parks.

I would now like to address somewhat minor issues but a couple that will be of help in the future to communities which are victims of these types of disasters. First, I would encourage the continued funding for the hazard mitigation process. The federal agencies which have come to Baytown's aid have been extremely helpful both in providing financial aid and assisting us in defining a course of recovery. Secondly, it would be helpful if for reimbursement purposes, minor tasks, that which would be defined by a certain dollar value, let's say for instance, $25,000.00 could be handled more as a grant. This would allow us to devote the majority of our audit resources to major projects such as our debris removal which ran several hundred thousand dollars.

Before closing, I feel it imperative to bring to your attention an issue that Congressman Fields has discussed—the need for regulations regarding barge anchoring or storage along the San Jacinto River near the I-10 bridge. As you are aware, Alicia put some of these barges against this bridge. The danger of this major road to Baytown being damaged or destroyed is a real one. We ask your support in Washington by initiating action to remedy this problem.

I have taken much of your time and I realize that I have asked for a lot. However, let me assure you Baytown is a City that also helps itself. The cost of recovery is very large. It will take much federal assistance and many local dollars. This is why that in setting the local tax rate for fiscal year 1983-84, the City Council of Baytown increased our rate by 8 percent—an increase that should produce approximately an additional million dollars of revenue to the City that will be directed for cleanup efforts. It was an action that was passed unanimously by the members of our Council and is supported by our citizens. The cost of cleanup and restoration of Baytown is a tremendous burden but together, we can and will accomplish this task. Thank you.

City of Kemah,
Office of the Mayor,
Kemah, Tex., September 24, 1983.

Hon. James J. Howard,
Chairman, Committee on Public Works and Transportation,
House of Representatives, Washington, D.C.

Dear Mr. Chairman and Committee Members: This is regarding the Federal Emergency Management Agency and the activities and problems that arise in smaller cities with a population of less than 5,000. With the limited income and resources of small cities we feel that paying twenty-five percent of such things as clean up and street and road damages are exorbitant and excessive. A more appropriate figure would be ten percent.

An example or illustration is the City of Kemah. Kemah has a population of 1,304 and cover an area of approximately two square miles. We exist mainly on Sales Tax Revenues. After Hurricane Alicia, the City was left with only four businesses operating out of thirty businesses. As you know, the normal expenditures of running a City did not cease with Hurricane Alicia. With the additional expenditures the City has to face because of the devastation caused by Hurricane Alicia, the expenses involved in the clean up and repair become prohibitive for smaller cities, with a drastic cut in the income for the immediate future.

An example of this can be illustrated in our last payment received for City Sales and Use Tax. Payment received for a period ending September 8, 1983 was $4,741.76, comparable payment for the year 1982, $9,834.65. The City's monthly average expenditure is $38,000.00. With only an additional $6,000.00 coming in from the Municipal Court and an added $2,000.00 in various other permits and licenses, I think you can see our problem.

It seems to me there should be a more equitable way for FEMA to help cities of our size that lose their entire income.

Thank you Mr. Chairman and Committee Members for your time.

Wilbur O. Wetzel, Jr.,
Mayor Pro Tem, City of Kemah.

Mr. Roe. Please proceed.

TESTIMONY OF HON. KATHY WHITMIRE, MAYOR, CITY OF HOUSTON; STEVE HUFFMAN, CITY MANAGER, CITY OF GALVESTON; HON. JON LINDSEY, COUNTY JUDGE, HARRIS COUNTY, REPRESENTED BY PERRY SIMMONS, ADMINISTRATIVE ASSISTANT; HON. HARVEY PETREE, MAYOR PRO TEM, CITY OF DEER PARK; HON. ALAN CANNON, MAYOR, CITY OF BAYTOWN; HON. WILBUR WETZEL, MAYOR PRO TEM, CITY OF KEMAH

Ms. Whitmire. Thank you very much. I appreciate the opportunity to review with Mr. Chairman and members of the committee some of the events surrounding Hurricane Alicia. I think it is probably fair to say that Houston, as the largest city in this area, experienced some of the greatest damage, but you can see my colleague from Galveston here with his wrists bound up.

I understand that the damage was even worse in Galveston, as they got the brunt of the storm. As a native Houstonian, I guess I was aware that a major hurricane might be coming through Houston at sometime in the not-too-distant future because it had been so many years since we had a hurricane directly hitting Houston.

So we had given some thought to what we would do if we experienced a disaster of this nature. At the same time, I don't think there is any way that the people of Houston would be adequately prepared for the extent of the damage that occurred with Hurricane Alicia.

I would like to mention to you some of the ramifications of Alicia on the day of the hurricane and then go on to some of the problems that we are still experiencing today in the aftermath of the storm.

We called together the various members of the city government and other support agencies from the county and the Red Cross prior to the day of the storm to make some plans and to have some emergency crews available.

We were glad that we did that. I would want to compliment the work of the employees of the city and the other agencies involved for really doing an outstanding job during the height of the crisis.

We had extra forces on duty from our police department, and I think we were able to keep looting to a minimum in the city of Houston. One of our most serious immediate problems was the reduction in our water supply which was brought about by the loss of power at our major water treatment plant and at many of our pumping stations throughout the city.

We immediately called on Houston Lighting & Power for their assistance and asked them to put the highest priority on repair of the electrical service as it serves our city water system.

While most of the city experienced low water pressure or no water pressure on Thursday evening, the day of the storm, by Friday evening that pressure was restored because of the efforts of Houston Lighting & Power together with the city of Houston Public Works Department.

I think that one of the things that we will continue to evaluate as a result of this storm is what steps could be taken that might allow us to provide alternative emergency sources of power to our water system in the event that we had that extent of a major loss of power to our water system again because we did have a number of people inconvenienced during that period of time on Thursday and Friday.

Certainly, a major inconvenience to our citizens and a cause of damage was the loss of electrical power. I am sure that you will be hearing much more about the problems associated with the loss of electrical power.

We do know that Houston Lighting & Power called in additional crews from other companies all over the State and worked very diligently to restore that power as quickly as possible.

However, as elected officials and city officials, we all had the opportunity to hear the serious suffering that occurred on the part of our citizens who went for days, some as many as 10, 12, 14 days without any electrical power, and that was a very serious problem.

One of the other items that we hope to be able to address better in the future is the need for ice. Both in Houston and Galveston, there was a desperate need for ice when many people were without electricity and did not have refrigeration.

That was one of the few areas in which we called on the State disaster office and were not able to receive the assistance that we would like to have received. We were never able to find any major supplies of ice to be brought in to meet the needs.

So people continued to drive around the city from store to store to store, trying to buy some ice since they didn't have their own sources of ice in their homes. I think that that was probably true in other cities as well.

We were very glad the day after the storm to have the Governor join us for a tour of the damage and to immediately call upon the President for the disaster area designation.

We were glad that that designation came on Friday evening and allowed us to immediately start working with FEMA in our efforts to obtain disaster relief.

FEMA assisted us in making some estimates of the damage and providing us information as to the assistance that they would be able to give us in repairing the damage and cleaning up the debris.

Our major project since the storm has been the cleaning up of debris. As anyone who would like to drive around Houston can readily see, we are still working on that project in Houston and certainly in surrounding areas, as well.

The great amount of attention nationally was given to the breakage of glass in the downtown area which certainly was a serious item of damage. But I would want to commend the work of the private sector together with the Houston Police Department and Public Works Department in the very rapid cleanup that occurred of that downtown glass breakage problem.

We had calls from the building owners on the day of the hurricane telling us what steps they planned to take to immediately begin that repair job before the rain had even stopped.

They immediately put crews on duty to break out the remaining glass and start putting the plywood into those open windows on Thursday afternoon, and their crews worked 24 hours a day, and were assisted by the public works department with their street sweeping crews and the Houston Police Department to keep pedestrians from getting into danger.

So that downtown area was ready for business again by Monday morning after the storm. I think a great deal of commendation is due for the people who work so hard to make sure that that was accomplished in a very short period of time so that there would not be further economic loss from the closure of businesses in the city of Houston.

We have appreciated the assistance that we have gotten from FEMA as we have undertaken a very costly project of storm debris cleanup. The city of Houston at this point has awarded contracts totalling $9.6 million for storm debris cleanup.

That, in itself, will not clean up all of the storm debris because we have continued to call on the voluntary efforts of our citizens to assist with that job. Immediately after the storm, we opened seven collection centers for storm debris, located around the city, because many of our industrious citizens were only too anxious to gather up their own debris and haul it away.

They needed a place to haul it to. So we identified seven pieces of city property to which they could take their debris.

We then assumed the responsibility from that point to make ultimate disposal of the debris. We did get good cooperation from the Texas Air Control Board in allowing us to institute some burning operations to burn large portions of the debris.

Other parts of it are being disposed of in landfills. We have undertaken an expansion of our usual "adopt a truck" program, which is a program of the city of Houston and a private association called Clean Houston, which allows civic clubs to undertake a neighborhood cleanup campaign with voluntary labor and make use of city trucks and drivers and equipment to assist them in that neighborhood cleanup campaign.

That is a year-round program that the city operates. It has been expanded since Alicia and we have had quite a few city clubs—10, in fact, I believe are working today on that program using city equipment to clean up their own neighborhoods.

We continue to encourage citizens to do what they can to clean up their own neighborhood and not wait for the city to be able to get there to haul away the debris.

It has turned out to be a more massive problem than I think anyone would have anticipated. I know that FEMA this weekend is making another assessment of the amount of debris.

Originally, we had an estimate of 2.7 million cubic yards of storm debris located within the city of Houston on right-of-ways and on the curbside to be picked up. They are going to make a reassessment this weekend to try to assist us in determining where we stand and how we can finish the job in the shortest time possible.

We did not start as quickly, we did not get geared up as quickly as I would like to have in the cleanup of the storm debris. I think this is an area in which we all have learned, both the city, as well as the people from FEMA.

I think that in those first few days, the first weekend after the storm, when our staff worked over the weekend to put together some emergency specifications to get out for emergency bids to hire contractors to work on the storm debris cleanup, we could have used some additional assistance at that time in the preparation of those specifications.

We did run into the problem of having individuals from FEMA indicate to us that they would or would not accept contracts with certain specifications.

We did not find that specific authority was always provided. We found ourselves listening to verbal indications of what would or wouldn't be acceptable.

That made it a little bit difficult for us to proceed in those early days. I am glad to say now that we have the operation geared up and we are at the level of collecting about 60,000 cubic yards per day of storm debris through our private contractors, and that is in addition to the work that the private citizens are doing on the storm debris cleanup.

The only other issue that I would want to mention has to do with the disaster assistance centers that were opened for our citizens to seek individual assistance with their own losses. We did not initially have a center open in Houston.

There were others on the outskirts of Houston and in some of the smaller cities. There was some discontent on the part of our citizens—I think particularly in Congressman Andrews' district—and we were ultimately able to get a center open for 1 week.

We felt that we might have been able to assist in providing information as to where those centers could best be located. While I can tell you we were all stretched to our limits in having plenty to do, I think that we might have offered some advice on that subject, as well.

Generally, the Federal assistance that we have received has been very helpful, and certainly welcome.

We had good assistance in the preparation of all the paperwork. I am glad to tell you that we got our check for $4.3 million this week as our initial advance on the disaster assistance from FEMA and that has been a source of great encouragement to us as we look forward to the completion of the cleanup campaign.

So let me just say that Houston has experienced a very significant natural disaster, one that has brought a great deal of loss both to the public sector and the private sector.

I have been extremely impressed with the resilience of our citizens, the way people have pulled together to solve our problems and get this disaster behind us.

We have been very appreciative of the support we have received from the State and Federal governments as we have proceeded in this effort. I wouldn't want to fail to say that we have received help, even from other cities.

That very first weekend of the hurricane, I got a call from the mayor of Dallas offering me some assistance. He did, the next Monday, send me quite a number of chain saw crews to come down here and help us with the clearing of the debris and the moving of the trees that fell on houses.

We felt that that was a sign of a great deal of friendship from our neighbors to the north in Dallas to send us those crews and help us during this time of disaster.

That is generally what we have found everywhere—people more than willing to step forward and help, both locally and on the national level.

So I would close by saying I very much appreciate your interest in this disaster that has occurred in Houston. I think we have learned a lot, and we appreciate your assistance as we put it all behind us.

Thank you.

Mr. ROE. Very fine, Mayor.

I think what we will do is run through all of the distinguished witnesses who are here so we have a continuity of the situation. Then we can revert to some questions.

Suppose we call upon Mr. Steve Huffman, city manager of Galveston.

Mr. HUFFMAN. Thank you, Mr. Chairman. On behalf of the mayor and city council of the city of Galveston, please accept our sincere thanks for permitting us the opportunity to testify before your subcommittee on the damages and recovery efforts associated with Hurricane Alicia.

I just want to say that, Mayor Whitmire, it is always nice to come visit this quaint suburb north of Galveston whenever I get a chance, but it is nice to be here.

I won't read my entire statement.

Mr. ROE. All statements have been placed in the record.

Mr. HUFFMAN. Fine. What I would like to do is briefly go over some areas that I think the city of Galveston is concerned about.

But, first of all, just to give you a little background, there was no storm-related deaths in the city of Galveston. However, the destruction was citywide.

My staff's current storm-related damage assessment is as follows: Commercial damage estimate is $355 million. Residential damage estimate is at $314 million, for a total of $669 million.

The city public property is located at about $9.4 million. Of course, we have the largest medical school in Galveston, which is the University of Texas medical branch. They suffered somewhere between $7 to $9 million worth of damage.

Some of the things I will hit briefly and I will give you the particular title. In regard to disaster relief center, the Federal Emergency Management Agency was in Galveston 2 days after the storm to set up a Federal disaster relief center for the citizens of Galveston County and to assist officials at city hall. They were very well organized and extremely helpful.

The city of Galveston provided our only civic center auditorium for the Federal disaster relief center. The civic center is managed by our park board of trustees and were extremely cooperative in providing this facility. It is the feeling of staff that some reimbursement of extraordinary expenses in regards to providing disaster relief center should be included in the reimbursement.

For example, our civic center was damaged to the extent of not having electricity, and we had to provide an extra generator and those sorts of things, so we did have some out-of-pocket expense in regard to providing that particular facility available for the assistance.

With regards to debris cleanup, the Federal officials and the Corps of Engineers were very helpful in assisting my staff with developing debris clearance bid specifications and contract awards. It did take a little time to develop the bid specifications and caused us some delay.

It would be extremely helpful if FEMA could provide at least the guidelines in advance so that we may get started in the process of developing debris clearance bid specifications so that they may review and have the bid awards as soon as possible.

If the criteria regarding the debris cleanup bid specifications should change at any time during the year, then FEMA should be responsible for providing that information to the local government in advance.

Therefore, it would give the local government the opportunity to have some guidelines in advance and have the preparation done by the time that the FEMA officials arrive in the scene shortly after the disaster.

For example, most of my community remembered Hurricane Carla in 1961. So they already had it made up in their mind that the Corps was going to move in and clean up the community.

Since that had changed, the council hesitated on whether to go out for bids or what the situation was. So the idea behind that is that if there are any changes, the local government be kept up and informed with those so we can be prepared for what the situation is.

In regards to the damage survey reports, or as they are called, DSR's, the FEMA officials preparing the damage survey reports were extremely thorough in their investigations. However, some of their restoration cost estimates, particularly in the area of street reconstruction, seems to be very low in most cases.

It is understandable that some of the streets were not in the best condition or had deteriorated to some degree before the storm. But even with that taken into consideration, the cost estimate seems low because the materials necessary to reconstruct the streets in Galveston are higher than they are in some areas.

The FEMA officials and the Corps of Engineers should take into consideration the cost of doing the reconstruction in the area in which it is to be done. In other words, maybe the higher cost of transportation in obtaining these materials.

For example, when we buy our HMSA, which is hot asphalt, the closest plant we have is in Pasadena, which means we have that extra transportation cost of bringing that asphalt down to the city of Galveston. So it might be cheaper in some areas to reconstruct the street as compared to our area.

The percentage of reimbursement. As with most cities, our city is faced with serious budget shortfall, which makes the 25 percent local contribution to disaster recovery almost impossible.

In January 1979, local residents imposed budget limitations which makes it almost impossible just to keep up with inflation. On our island, over 45 percent of the property is tax exempt, which represents primarily Federal, State, county and local properties. Therefore, it is our suggestion that the committee look at increasing the present 75 percent FEMA reimbursement to possibly 95 percent reimbursement for certain cities in certain cases.

The consideration could be used by a formula method on amount of Federal, State, county and local government entities that cause such a high tax-exempt situation.

We set up a recovery task force. Approximately 5 days after Hurricane Alicia hit the city of Galveston, the city council appointed a recovery task force. This task force is made up of 20 individuals. The committee was divided into subcommittees in areas such as construction moratorium and controls, price freezing, temporary housing, utility restoration, health and emergency, medical, west-end blockades and curfews, beach and dune issues, Federal and State assistance, financial impact, communications and civil defense, shelters, evacuation and return, insurance settlements and maintenance, relief needs, and return to normalcy.

The committee met every day at 7:30 a.m. for 1 hour for the first 2½ weeks after the hurricane. Since then it has met 2 days a week at 7:30 a.m. on those mornings. This committee has made recommendations and changes in the building code and zoning areas. These recommendations have been submitted to the city council and the council has taken the necessary action to implement the recommendations.

The long-range responsibility of the recovery task force is to develop some mitigation procedures. A proven effective approach to manage anticipated development to insure safe, efficient use of Galveston resources is to prepare a development management system based on carrying capacity analysis.

This development management system should take into consideration in future developments: One, limited water supply; two, ability of soil to absorb waste; three, capabilities of traffic and evacuation; four, availability of land; five, environmentally sensitive nature of the island; six, limitations on multihazard areas.

The FEMA officials could play a very important role in the development of this management system. If the FEMA officials were made available in the mitigation process to advise, particularly, with their experience and expertise, in developing this management system, it would be very worthwhile.

Another area that they could be most helpful is when the city of Galveston or any other city, for that matter, is developing a particular facility such as a sewer plant, fire station, or whatever, in a flood plain, FEMA could be called on to advise us in the mitigation of hazards, such as waterproofing of the facilities and the safeguarding of those facilities for future hazards.

FEMA should arrange to hold training sessions for the Federal agencies which normally support the Damage Survey Report process. It is apparent that many Federal agencies involved in the DSR process are not fully aware that mitigation measures can be proposed in addition to what is normally considered eligible work to restore the facility or structure to predisaster conditions. In many cases, these mitigation measures—flood proofing—can be funded up to 15 percent of eligible DSR work.

The responsible hazard mitigation team agency person should arrange to identify people who will normally be asked to support public assistance DSR activities. These people will then be given comprehensive training to include identification of alternate construction practices, flood proofing, "no action" recommendations, et cetera.

In regards to some FEMA recommended changes, staff recommends favorable considerations for the provision of technical assistance to cities to study indepth recommendations made by the mitigation team. So often the mitigation team identifies problem areas whereby local government neither has the expertise to explore further or has the financial resources to hire outside experts to develop a solution.

Another request to Congress regarding possible changes is that for individual projects under $25,000 should be a direct grant provided to the city rather than the present required damage survey reports, support documents, and audit requirements. It would be more cost effective if the present procedure was waived.

On those particular items, particularly the high cost of having to maintain individual records, having it audited and ~~the same~~ with FEMA, if that one individual project was $25,000 or less.

In closing, let me reiterate my sincere thanks to you and your subcommittee for permitting me to testify today. I trust that my comments are taken on a positive manner because overall FEMA officials have been extremely helpful.

I think as Mayor Whitmire mentioned, I think probably all of us will mention, is in regards to debris clean up. It seems to be the biggest headache of all, particularly after we awarded the bids.

It seemed like everybody expected miracles and everything to be picked up. But there is all sorts of problems in regards to those people subcontracting. They are subcontracting to subcontractors, and then people running over their lawns or breaking sidewalks, and constant calls that you get that they left a pile or they broke my curb or whatever.

That seems to be some of the biggest problems in regards to that debris clean up. But at the end when everybody finishes, I will be glad to answer any questions.

Mr. ROE. Very fine.

Representing Judge Lindsay, we have with us Mr. Simmons.

Mr. SIMMONS. Thank you, Mr. Chairman and members of the subcommittee.

Judge Lindsay regrets his inability to be here today, but he would express his appreciation for being invited to testify today.

Dr. Carlton Rush, of Texas A&M, developed in 1981 a storm surge model which formulated evacuation plans based on varying storm characteristics. For example, a hurricane due south of Galveston 250 miles away moving due north at 5 miles per hour with 120 mile per hour winds would require that evacuation be started in Galveston 30.5 hours before landfall.

Responding to these facts, the Harris County Commissioners Court by official order dated September 29, 1966, established a Harris County plan for emergency preparedness. This emergency operations plan, EOP, described the organization, facilities, and techniques for effectively providing for disaster emergency services for Harris County and the steps to implement the requirements of Federal, State, local laws relating to disaster situations. The plan is revised and updated yearly.

The focal point of operations in an emergency is the R. E. Smith Operations Center at 330 Rusk Avenue, Houston, which serves as a joint venture for the city of Houston and Harris County's response efforts.

On Wednesday afternoon, August 17, the day before Hurricane Alicia's arrival, Mayor Kathryn Whitmire called an emergency conference at the emergency operations center to discuss the state of readiness for the hurricane. Major department heads—the police chief, the fire chief, the public works director, as well as key defense leaders—were in attendance.

Every facet of preparedness, including the availability of personnel and equipment and areas of responsibility were explored and reviewed. My administrative assistant, Perry Simmons, represented the county to report on Harris County's actions to attain full emergency condition.

Harris County's main concern was the expected flooding in our 19 watersheds. Our county flood control district was activated on emergency status and had disbursed personnel and equipment to key areas to monitor flood conditions. Every key department responsible for the protection of life and property were placed in a state of emergency.

I will omit details of the actual event which have been well publicized. Assistant Director of Defense and Disaster Relief, John Caswell, subsequently reported to me the commendable fashion in which the emergency operations center performed during the emergency.

At this point, we have not discussed in depth any improvements or recommendations that should be incorporated into our emergency plan as a result of the Alicia experience. I was well pleased with all county departments that responded under trying conditions to alleviate the effects of the disaster.

My office wired Gov. Mark White on August 18 asking that he request a Presidential declaration for Harris County as a disaster area as a result of damages incurred from Hurricane Alicia. FEMA and State emergency personnel began to arrive even before the Presidential declaration became official.

On August 24, FEMA and State emergency officials called a meeting at which they outlined the procedures to be followed by counties, cities, villages, and nonprofit organizations in estimating damages and seeking reimbursement.

They announced that three disaster relief centers would open the next week to process claims for individuals and that FEMA, SBA, IRS, and other Federal-State agencies would be present to assist them.

Harris County suffered immense damage throughout the county but the major impact was concentrated in the northeast, east, and southeast portions—those areas lying adjacent to Lake Houston, Galveston Bay, and the Houston ship channel.

The most serious blows were incurred at our major parks in those areas—Deussen, Sylvan Beach, and Clear Lake—where extensive tidal effects caused structural damage to piers, bulkheads, and recreational buildings. Widespread debris damage from high winds was prevalent in all areas.

Rainfall and flooding was much less than anticipated. A very serious situation was narrowly averted on the San Jacinto River where barges broke their mooring and threatened to destroy the I-10 bridge over that waterway.

Two barges came to rest against the east bound lanes of that bridge and ships were aground on top of Market Street that runs parallel close by. This points out the necessity for the U.S. Coast Guard to develop a contingency plan to move these vessels to other areas during hurricane situations.

Not only is the Interstate 10 a major Federal highway, but it is the main evacuation route of Baytown and other east Harris communities in times of emergency.

Major debris damage was incurred in all county parks and they have been closed to the public pending clearance of those areas.

Harris County began its debris clearance efforts immediately following the passage of Alicia. Each precinct began making damage estimates for debris clearance and structural damages to facilitate a damage survey summary to the Governor's Office of Emergency Management.

This summary was sent to them on August 31 and our preliminary estimates totaled over $33 million to public facilities, of which $6 million was for debris clearance.

FEMA and State officials have worked very cooperatively with us in our recovery efforts. Our top priority was focused on debris clearance from county roads and bridges as well as from flood control facilities.

Our cleanup operations are being done with our own personnel on a time and materials basis which necessitates the leasing or rental of certain equipment to do the work. FEMA, considering the magnitude of the disaster, has done a favorable task in supplying the disaster survey teams to compile the reports necessary toward seeking reimbursement.

The Corps of Engineers has been of great assistance to our county personnel. The county has furnished its own dump sites and conducted its own burning operations at no expense to the Federal agencies.

While we have had some disagreement with FEMA over the methods used in debris clearance, I think we are both pleased with the progress made. County officials estimate that at this time we have completed 95 percent of debris removal throughout the county, excluding our parks which we intend to clear mainly on a contract basis.

The damage survey reports on structural damages has proceeded at a much slower pace. We currently estimate that approximately 20 percent of that type has been completed.

I would like to emphasize the invaluable contributions made by the national weather stations at Galveston and Alvin during the Hurricane Alicia experience. The skills and dedication of those involved at these locations cannot be applauded too highly.

I would invite your attention to a recent report done by the consulting firm of Booz, Allan & Hamilton for the National Oceanic and Atmospheric Administration which deals with certain needs and projections for that agency over the next 20 years.

While I have not seen the report, it is my understanding that the 18 existing weather service facilities in Texas could be reduced to two, possibly to be located in the Fort Worth and San Antonio areas.

I would be vehemently opposed to such a plan becoming a reality because of the serious ramifications it would have on our ability to protect life and property in such a hurricane-prone area. Certainly the input of local and congressional officials should be utilized in any decisions affecting the Galveston and Alvin stations.

We certainly would thank you again for holding this hearing in the hope it would improve our hurricane preparedness.

Mr. **Roe**. Very fine.

Mayor Petree.

Mr. **Petree**. On behalf of the mayor of the city of Deer Park, I would like to thank you for allowing us to participate.

Hurricane Alicia hit us, as it did everybody else. The big problem we had was obviously the debris cleanup. We started the next day cleaning up debris.

At first, the problem—one of the biggest problems, I suppose, we had was what would we do with this debris. First, we started putting the debris on a piece of city property that was surrounded by home sites, and with possibly later transferring it to a landfill site somewhere out of the city.

After possibly a week of hauling debris to this site, we determined we would be able to burn the debris on another site within the city limits. So after starting to burn the debris, we got the steets cleaned up fairly rapidly.

Then we had the problem of transferring the large amount that we had hauled to the original site to the second site. We had some severe damage to, I think, three of our city buildings, structural damage.

I guess the major problems that we had were the same as everyone else has described to you. We have had very good assistance from the FEMA folks.

We have no complaints whatsoever at this time.

Mr. Roe. Mayor Cannon.

Mr. Cannon. Mr. Chairman, and members of the Subcommittee on Water Resources, thank you for providing me the opportunity to appear before you and testify on the damages incurred by the city of Baytown and our recovery efforts associated with Hurricane Alicia.

Hurricane Alicia was the most devastating ever to hit Baytown and left its mark in damage and lessons learned. The cleanup still continues as I talk with you today and promises to be a long and difficult task, of which my colleagues have testified.

To enable you better to understand the extent of the damage in Baytown, allow me to give you a brief description of my city. Baytown is a city which comprises 30.1 square miles, a residential population of over 59,000.

It has a large industrial district made up of Exxon Chemical, Gulf Chemical, Mobay, Stauffer, United States Steel, and others. Baytown has over 4,500 other small businesses.

Its school district is made up of 2 high schools, 6 junior schools, and 13 elementary schools. Baytown has over 16,000 single-family dwellings and over 6,000 multifamily dwellings.

Hurricane Alicia left a dollar damage figure in Baytown of more than $60 million. The Brownwood subdivision was devastated by the storm. Three hundred homes in what we are now calling the Brownwood Hazard Area were, in our estimation, totally destroyed.

Throughout the remainder of the city an additional 576 homes were damaged or destroyed. Approximately 228 apartment units were affected.

Over $10 million in damages were incurred by Baytown businesses which includes about 2 million in damage to our new shopping complex, the San Jacinto Mall on I-10. The school system received damages totaling $1,700,000. Finally, the city's facilities itself received considerable damage.

The Federal Emergency Management Agency held meetings with municipal officials on August 24 to explain their public assistance programs. Following this meeting, damage survey teams from various agencies arrived in our community to complete public assistance damage survey reports. They finished their inspections on the 15th of September.

These reports covered damages to our utilities, buildings, streets, parks, and the costly debris cleanup. It is presently estimated by these reports that we sustained over $1.1 million in damages. This figure excludes the costs associated with the Brownwood subdivision.

The Brownwood subdivision, or what is now referred to as the Brownwood Hazard Area, is in many parts below sea level and its underground utilities are inoperative or unsanitary. The inner streets were covered for days by water and the road bed which they rely on for support has surely deteriorated.

The perimeter road, which we built a good many years ago, which serves as a dike around the homes has received wash effects from the storm. In addition, there is a tremendous debris clearance program which is magnified by the abandonment of properties in this area.

A number of people have made aerial surveys. Mayor Whitmire, I believe, probably saw the damage that we had out there.

The FEMA officials have not at this time indicated the total amount of support the city of Baytown can expect to receive in this one area. There has been discussion that the city may receive Federal assistance to remove debris from the homes down to the slab on a 75/25 sharing basis.

This discussion is promising but does not go far enough. The city needs help also in removing the slabs. Using a conservative figure of $1,000 per slab, the cost will be some $300,000. This commitment is necessary if we are to insure the safety and health of our own citizens and return the Brownwood area to a natural state.

Even though the Brownwood Hazard Area remains a problem with very little visible progress towards cleanup, other portions of the city cleanup effort have progressed very well.

The debris cleanup effort has made tremendous strides. Our city engineer estimates that we had over 300,000 cubic yards of debris to remove from streets and street rights-of-way. Inspectors from the Army Corps of Engineers felt that the figure was conservative.

After 4 weeks, the city of Baytown has nearly completed all street and street right-of-way debris removal. This has been accomplished using our own employees and outside contractors. We feel that our operation has been efficient and cost effective.

It is estimated that our costs will remain below $3 per cubic yard for removal and disposal combined. Field inspectors from the Army Corps of Engineers have complimented our staff on their efforts and management of the debris cleanup effort.

Presently, we are occupied in the clearance of debris from our parks. The city of Baytown has 33 parks covering 380 acres of public property.

Many of these parks were heavily wooded and will take a century to recover even if we were to start today on a restoration project.

The rules governing FEMA public assistance do not provide for the revitalization of parks property. There are no provisions for the type of extensive tree planting required to reestablish the beauty of our forests.

The city of Baytown would welcome any assistance available from other Federal services, such as the U.S. Forest Service to support and complement our efforts to return our parks to the condition they were in prior to the storm.

Throughout our parks, we estimate over 205 pines and oaks were lost. Replacement of these trees will take decades given our restricted financial situation, therefore, we request any available assistance in the form of grants for tree planting in our public parks.

I would now like to address somewhat minor issues but a couple that will be of help in the future to communities which are victims of these types of disasters. First, I would encourage the continued funding for the hazard mitigation process.

The Federal agencies which have come to Baytown's aid have been extremely helpful both in providing financial aid and assisting us in defining a course of recovery.

Second, it would be helpful if for reimbursement purposes, minor tasks, that which would be defined by a certain dollar value, let's say for instance, $25,000, could be handled more as a grant.

This would allow us to devote the majority of our audit resources to major projects such as our debris removal which ran several hundred thousand dollars.

Before closing, I feel it imperative to bring to your attention an issue that Congressman Fields has discussed, and Mr. Simmons alluded to, also, the need for regulations regarding barge anchoring or storage along the San Jacinto River near the I-10 bridge.

As you are aware, Alicia put some of these barges against this bridge. The danger of this major road to Baytown being damaged or destroyed is a real one. We ask your support in Washington by initiating action to remedy this problem.

Those of you who live in the area, you recall we had damage done to an overpass some 2 years ago. You know what a fiasco that was. They were able to come back and put a bypass after some 30 days.

But at the time, commuting from Baytown to that area, we don't need that in our area.

I have taken much of your time and I realize that I have asked for a lot. However, let me assure you Baytown is a city that also helps itself.

The cost of recovery is very large. It will take much Federal assistance and many local dollars. This is why that in setting the local tax rate for fiscal year 1983-84, the city council of Baytown increased our rate by 8 percent, an increase that should produce approximately an additional million dollars of revenue to the city that will be directed for cleanup efforts.

It was an action that was passed unanimously by the members of our council and is supported by our citizens. The cost of cleanup and restoration of Baytown is a tremendous burden, but together we can and will accomplish this task.

Thank you. I will be happy to field any questions.

Mr. Roe. Well, at the outset, let me thank you all for a splendid, concise presentation.

Nothing like being on the firing line in so many ways, and then having a chance to not only express what was accomplished. And one thing I have noticed, I did do quite a bit of research before I came down, and I did notice that there was enormous help from a voluntary point of view, where folks in their respective communities really got in to be helpful.

Also, the young people. I read quite a report on that which I think is a great compliment to the citizens of this area. One thing, Mayor Cannon, on that barge anchorage plan, that is an excellent idea.

We have already made notes of that because we are developing the water resources development legislation and that is an element that could be added immediately and rightfully so as an amendment in that process we are following now.

So we will get into that immediately. Let me share with you some other thoughts which I think are important.

I come from New Jersey, as you know. That may seem far afield from Texas and it may seem far afield from Alicia, but let me tell you something, we have had some real beauts on our eastern coast.

The damage has been extraordinary. In reviewing the background to what we are discussing today, the law really has not been substantively changed since 1974. There have been slight amendments.

I am talking about the Disaster Relief Act. It seems to me a number of things in reviewing the background on this situation, you have high levels of unemployment throughout the Nation, for example.

There are many people that drop their flood insurance payments simply because they couldn't carry them any longer. Therefore, they are ruled out at the moment, at least under the present law, of any help unless it is the direct help that they are eligible up to $5,000.

So, many people are being wiped out simply because of the economic dynamics of our time, which seems to me has to be dealt with and should be dealt with on an emergency basis, is one item.

I note from the testimony that part of the concern is the cleanup of the debris. Obviously, that seems to be a major issue. But, you know, going behind that issue, it seems to me the following.

How lucky we were if we can look at it in one respect because had there been a followup to that storm of torrential rains, the damage could have been extraordinary and the loss of life would have been that much greater, God forbid.

But it seems to me that on the basis of what you are testifying today that the debris removal is not just an esthetic thing. I think to myself the vital need to be able to get fire trucks through, police vehicles, first aid squads, anything of that nature, to be able to accommodate anything that could happen.

It seems to me that the power situation which we are going to have testimony on later is terribly important because that shuts off the energy to your sewer plants and your traffic systems and computerized actions.

It seems to me that the things we should be speaking about for this region, not only this region, but areas throughout the country in revising this law would be based upon the enormous growth that is taking place in your area.

What about an evacuation plan? Had there been, God forbid, again, a followup of heavy rains or another couple of tornados, and we had to remove tens of thousands of people, how would we get out?

Would there be accessibility to major evacuation routes for them to be able to get out of there?

So it seems to me that you are providing an enormous opportunity, and I guess out of tragedy and adversity, that happens, to take another real serious look at what is happening in the country, natural disasters, which none of us has control over.

Also, it seems to me that we ought to be able to project better on—I am talking about a Federal level—on the sense of being able to advise our communities and cities in saying, hey, look, this is really serious. Here is your lead time.

We ought to have standby medical provisions where you can move in immediately with the help that you need rather than to wait for that declaration. We have added an amendment to the water resources development bill only recently—I see the colonel representing the corps is here, mention that to him; that is in legislative flow now—to give the corps, once they are into operations, the authority to continue on while FEMA is setting up its work 5 days addition. We will take another look at that.

But I would think that in looking at the growth of our Nation and what is happening in many areas throughout the country, when we speak of evacuation plans, when we speak of being ready in advance, when we speak of advance warning issues, when we look at the impact upon the infrastructure, water, sewer, police, that we have got a lot of revisions to make to this bill to make it really worthwhile and workable. And when there are natural disasters that happen, we call upon each other, basically as you have done in your cities and towns, through voluntary and cooperation, but it is also the responsibility of the Nation.

So, having made that statement, I would now like to defer for specifics to get some of your thoughts on that, and also call upon Mike to elucidate further, if you will, Mike.

Mr. ANDREWS. Good. Thank you, Mr. Chairman.

I appreciate your comments. I know all of us in Houston do.

There are several concerns I had. The testimony yesterday was most interesting in dealing with the information flow of the National Weather Service and the kind of decisions that you all were called upon to make in a very critical time.

A concern that I have in hearing you talk today is how do we need to be formulating national policy in terms of getting weather information to you to make appropriate decisions.

A glaring void appears to me, and that is coordination among the many municipalities in our area. Our storm was unique for several reasons.

It was unique in the sense that it struck an area in which there are so many communities, Baytown, Deer Park, Louisiana Port, Shore Acres, and the city of Houston, and how we can better coordinate among ourselves for evacuation routes.

I would like to ask you to comment as a group and certainly you, Mayor Whitmire, do you think that your communication was sufficient?

Do we need to make changes?

Should there be, as the chairman has suggested, a broader plan as we face the next hurricane to strike our area, whether that mayor of Deer Park will know whether the mayor of Galveston has ordered an evacuation and could have the decision, that be fed into judgmental process.

I see some serious consequences if one mayor in one community is trying to make decisions without really knowing what is happening at another part of the gulf freeway.

I think there would be serious—the mayor of Shore Acres found himself without electricity, without a phone line, in the dark in the mayor's office in Shore Acres, with water in his office, trying to make life-or-death decisions about whether or not to tell people to leave their homes or to stay.

I know that each one of you faced those same kinds of critical decisions. So that is an area.

And because of the nature of the jurisdiction of our committee, certainly, how we prepare for these imminent disasters, I have some concerns that the FEMA organization was slow in getting started before this hurricane.

I would like your comments about that. Should we make changes in the law whereby possibly a strike force from FEMA would come into an area prior to a hurricane hitting land to find locations, emergency centers that may hopefully not be necessary, but, if they are, at least we have that 2 or 3 day or 1 day leadtime that could save lives and save us precious dollars along the way.

Those are my comments in general, Mr. Chairman.

Mr. ROE. Anyone wish to respond? Who wants to go first? Mr. Simmons?

Mr. SIMMONS. I would certainly subscribe to Congressman Andrews' remarks about FEMA maybe being on the scene earlier. It seems that their response is after the fact, and I would certainly think that upon the declaration of the hurricane zone, which is June 1, that they at least should have some skeleton crew in the hurricane-prone areas with a temporary office and with an option to rent more space in the event a disaster would hit.

And also that they approach all the local officials to brief them on the information that they gave us this time afterward, because there is a continual change of personnel both in municipal and county government.

These particular people entrusted with this responsibility should know that in advance rather than after the fact.

Ms. WHITMIRE. I imagine we will be unanimous in indicating we would like to see FEMA onhand a little earlier. As I indicated, we could have used additional assistance on the weekend.

But that really focuses just on the cleanup more than the immediate disaster itself. While we had so much problem with the lack of power, I think that there are a variety of ways in which we could have used assistance during that very critical time.

Let me address the communication issue a little bit, as well, because certainly, the mayor of every community is called on individually to make some very critical decisions about what will be done in that community, and the more information we could have, the better we would be able to make those decisions.

We had advantages in Houston because of the joint venture with the county and in our Houston/Harris County emergency management arrangement, so that we had a communication center and probably had better information than most of our colleagues in the smaller cities.

But when it comes to the subject of evacuation, I think that we still have a very long way to go in all of Harris County in making some difficult decisions as to what we could do about evacuations if they were necessary for us.

Mr. ANDREWS. Mr. Chairman, if I could ask a specific question.

Mr. ROE. Sure.

Mr. Andrews. Mayor Whitmore, just to follow up and ask you to comment, should a mayor make that decision? Do we find ourselves in a situation where public officials are asked to evaluate highly sophisticated, very technical information from the National Weather Service, and from other sources, and to make decisions based upon that information.

Should we not suggest that the National Weather Service participate more in that kind of decisionmaking? Is it too much to ask of a mayor in a small community that may not be well versed in weather technology to make a decision that he may make based on politics, and not so much on the weather situation at that time?

That is a broad policy issue. I am not necessarily speaking about this storm, but in future storms, and especially, again, in an area where we have so many communities and those kinds of decisions made by one affects everyone else, should we have some sort of regional decisionmaking process that is made more on the technical side, rather than a judgmental side by a public official?

Ms. Whitmire. We are trying to decide who wants to respond.

Mr. Huffman. I am going to let the mayor start on that one.

Ms. Whitmire. That is a very difficult question, because in each community, somebody has to take the responsibility and somebody has to take the complaints afterward, and the criticism and second-guessing.

Most of us in local government have found that that duty usually falls to the mayor. I think that what we would be looking for is a greater degree of advice and technical assistance in making these decisions.

For my part, I doubt that very many communities would want to have those kinds of decisions dictated from a higher level. That is speaking for myself.

Mr. Roe. If the gentlelady will yield for a moment. Having served as a mayor myself, so I was a colleague down there with you for many years, as Mike would know, that the types of disasters are variable.

I mean, you know, you were very lucky. You were extraordinarily lucky because had that followed up with torrential rains, with the debris in your storm drains and sewer plants, in short order you could have been in one terrible mess in relating to evacuation of people.

So it seems to me that what I see as a shortcoming here is one that because of the mechanism in the Federal law—and I can't fault FEMA on that—they can't move under the jurisdiction unless the declaration is declared.

So you don't have the power to declare the declaration. That has to be declared, one, by the Governor, and call upon the President; two, that was set up in that direction to create a straight line from the chief executive of a State back to the Federal Government as point No. 1.

The corps has authority to come in if there is a flooding situation and loss of life and so forth. They can come in. That bases around FEMA.

Contrary to that, one says, well, if that situation exists where the corps couldn't move immediately, then the sole jurisdiction lies with FEMA to come in and get organized.

Well, in the meantime we are bleeding to death. It seems to me that there ought to be some kind of a regional disaster plan because it affects everybody.

There ought to be, certainly—and we have that developing in my State—an evacuation plan, what you do with people, how you get people out of there.

A severe accident takes place, somebody gets killed, you can't get an ambulance in, do we have helicopters available and that sort of thing.

So I think a great deal of responsibility lies with the people involved only because of the nature of the beast, so to speak.

But as Mike pointed out, it seems to me that we have got to create some mechanism for you to be able to react faster so that you are not waiting for the Federal Government to make a decision.

Mr. HUFFMAN. Mr. Chairman, if I may, being from Galveston, and being the city manager of Galveston, a little bit different than a strong mayor form of government as in Houston, but that is the only difference that I am talking about insofar as the responsibility sometimes goes to the mayor, sometimes it is my responsibility.

But with regards to an overall plan of evacuation, I think it is desperately needed for this reason. The city of Galveston only has three ways to get off the island, and two ways to get off out of the three will be cut off with about 4-foot tides.

One is by the ferry and one is with the bridge going to even a lower elevation than what we are. So those would be cut off.

So the only way to get off the island when it is necessary to evacuate is I-45. I-45 goes right through the middle of the city of Houston.

If we don't have some sort of coordination with the city of Houston, then we are going to have a very difficult problem evacuating those people. We have a population of 62,000.

But any time during the summer, which is also hurricane season, we can have as many as up to 150,000 to 200,000 people on the island for summer vacation, second homes, visitors, hotels, whatever.

To run that many people off the island—I shouldn't say run them off, but to evacuate them off—I have to watch my terminology or I will get in trouble.

Mr. ROE. You will hear about that one.

Mr. HUFFMAN. I know. Before I even get home my phone will ring. But to evacuate those sorts of people, to have them outside of the danger of hurricane——

Mr. ROE. If the gentleman would yield. It can very readily be that those visitors are coming from all over. They are not necessarily from this region.

They would not have the understanding of the order of magnitude of the problem they face.

Mr. HUFFMAN. That is correct. You could get somebody from Arizona and what do they know about hurricanes. They may know about sandstorms or a guy from Kansas might know about tornados, but they don't know about the water.

So you have a problem. To get back to it, not only the city of Galveston has to go through the city of Houston, as you go up from

Galveston, you pick up the city of Texas City, which is another 30,000 or 40,000, and Lamar, and Litchcock.

As you proceed up I-45 to Houston, you have probably picked up another 300,000 or 400,000 people, particularly in the Clear Lake and other areas that are very low-lying.

They will probably have to go up I-46 because 46 is very low, also. There needs to be some kind of regional plan as far as evacuation is concerned and coordination so that we know which routes we need to proceed to if there is a decision made to evacuate the island.

Where do we send our people so we don't get them mixed in with the city of Houston or the city of whatever on the way of evacuation?

Mr. ROE. As Congressman Andrews mentioned yesterday, I read in the newspapers this morning, he took a very firm stand on the point of view of cutting back on advanced warning weather stations and commercializing that.

I think you have all testified that would be a terrible decision to make. I think that what he has suggested, and he is going to take the lead on that. We talked a little this morning. You know, we all have priorities financially.

We understand that. We have our problems we are all faced with at every level of government fiscally. But this is no time to make that kind of a decision.

What do you think about that?

Mr. HUFFMAN. I would say it is most definitely, because if you cut back to save money on the short run of the National Weather Service, in the long run, it is going to cost Congress and everybody else a substantial amount of money if those people aren't adequately warned from the information provided by the National Weather Service, that FEMA is going to be down here spending a lot more time and money to put the city back because we were not adequately warned, to do the necessary protection or mitigation possibly just before the storm, because there are certain things that you can do for security before that storm walks in on you.

If you have got that advance notice and as much information provided out of the Weather Service, we have the radar station located in Galveston. Their office is 1 block from my office, so I can walk out my door, run down the block and talk with them.

I can get that personal input. By the time they are getting it back across to everybody or sending it out, we already have the information.

At least, sometimes just because you read this hard copy of that printout about this, this and this, it does not really say, hey, you know, this is there and possibly this could happen.

To have that weather station in Galveston is extremely important. It is amazing the number of people that utilize that weather station in Galveston.

To have that radar that much closer to the Gulf of Mexico, then saying, OK, we are going to move the weather radar station out of Galveston, move it to Alvin, then you have lost another 35-mile distance of where the radar stretches out to see what kind of storm you have got out there.

So it is very, very important to us that the National Weather Service stays in Galveston. I think it would be very shortsighted to try to save a few pennies today when it is going to cost you a lot of bucks tomorrow if that storm moves in and those people aren't forewarned.

Mr. **Andrews**. Mr. Huffman, you are preaching to the choir this morning.

Mr. **Huffman**. Yes, sir.

Mr. **Andrews**. The three of us all feel very strongly about this very issue. I have introduced a resolution to prohibit the sale of the weather satellites—both Congressman Roe and Congressman Vandergriff are sponsors on that resolution. I think equally as important to our area is closing down some of our local facilities. We talked about that at great length yesterday through the Science and Technology hearing.

But just for the purpose of the record, Mr. Simmons has already made a comment by Judge Lindsey for it.

Kathy, I wonder if you would also comment, your view about whether or not these weather stations in our area should be moved farther inland, and some of the staff people cut back.

Ms. **Whitmire**. Well, absolutely we would not want to see that happen. The information that we got from the Weather Service was extremely beneficial to us in the preparations that we made, and we would be very apprehensive about any cutback in the stations in this area or the staffing that was available to provide us that advanced information.

Mr. **Andrews**. Mr. Chairman, could I turn to one other subject very quickly?

I would like to ask you, especially Mayor Whitmire, do you feel that the FEMA people consulted with you adequately about the emergency sites that they were going to—that they established? Was there timely discussion? Was it thorough discussion about where the sites should be located?

Second, do you feel the information about where those sites were, the notification to the public at large, was sufficient?

Ms. **Whitmire**. Well, there has been a lot of discussion on that subject. I think you could debate whether or not the public notice was sufficient. We did not feel that we were consulted about the location of the emergency assistance sites. We had been notified the first day after the hurricane by the Governor's staff that we would in fact be consulted on those locations.

But in the rush of everything else that happened, we were not aware of any such consultation. Ultimately, we did get involved with our congressional offices in asking for an additional center to be established to better serve the citizens of Houston.

But it would seem to me that more planning in conjunction with our local elected officials would be in order for the establishment of those disaster sites, and perhaps better publication of the type of assistance that is available because we need to keep in mind that the majority of the people in Houston have not previously experienced a hurricane. And they were not necessarily aware of FEMA and of any other information about Federal disaster assistance. And so I think that more information would have been helpful.

Mr. ANDREWS. Doesn't that also point out, as we discussed earlier, the need for the possibility of a strike force of FEMA people to come into an area before the disaster rather than 3 or 4 days after the event, and the possibility that we may need to change some of our regulations and Federal law to respond to that need?

Ms. WHITMIRE. I think that recommendation is certainly commendable. I have to confess, though, as I think back to days just prior to the hurricane, a lot of us didn't really think it was going to come to Houston. We did call our emergency planning meeting the day before the hurricane, and we were gratified with the work of the Harris County Flood Control District and the city storm sewer maintenance division to clear out some of the bayous and storm sewers to try to avoid flooding.

But even as we took those steps, I think we remembered Hurricane Allen a few years ago and the fact that so many people had taken so many precautions in preparation for that hurricane and then it came, went through by Corpus and on down through Brownsville. And it was very difficult to convince people in this area that in fact we needed to take extraordinary measures to prepare for this hurricane.

So I am not, while I think the recommendation is absolutely commendable and that we need to do more advanced planning, I think we will always face the problem of people not really believing the hurricane is going to hit them.

Mr. ROE. Wouldn't we be? I think Mr. Simmons brought that point up, it seems to me we have enough information in the Nation now over the years to know that there are areas that are prone to certain types of natural disasters. For example, if it is going to be an earthquake, God forbid, in California, San Francisco, that happens. And very little warning. That can be disastrous.

In one respect if we have got a storm developing, say a hurricane off the coast of New Jersey, we know that, hey, you better get on with it. It would seem to me that we might want to consider giving FEMA added authority in legislation to come back and say the following, as I think was started to be developed by Mr. Simmons. We know there is a hurricane zone. We know the areas that are prone.

And it seems there ought to be some kind of advanced plan or program where any time, right during the season. Hypothetically, let's assume it was to begin in June, or whatever the time is, and has a chance to run to say the middle of October. Fine, let's be on the alert right then and there, so that if any particular storm starts to develop and so forth, there is an action plan where FEMA can be available immediately to respond.

Not only to respond, I like what you are saying, to be there, OK, fine, during that season. That is high warning season, and where we might go 3 or 4 years and get all the breaks in the world, but all of a sudden it comes down on our areas, and we have had it.

In the meantime, our people are alerted to it. People have a tendency, I know in my area, it is a crazy thing now. In the heavy metropolitan northeastern areas, such enormous growth has taken place as has taken place here, by the way, that rivers there used to crest maybe within a day and a half; now it is a matter of hours. In 2 hours' time they can be inundated in those areas without even being prepared for it.

So I think that some kind of a national system that came back and said that where there are high-prone areas for hurricanes. Historically we know, that there ought to be some kind of special arrangement made during those seasons in advance. Better we should have precautionary medicine than wait until the patient is dead.

Ms. **Whitmire**. I think that would be helpful to all of us.

Mr. **Roe**. Tom, do you have any questions?

Mr. **Vandergriff**. Actually I do have a few specific questions I would like to ask. I, too, as was mentioned by Congressman Roe, am a former mayor. In fact, I have been a mayor of a small city, a medium-sized city and a large city. I stayed around long enough that the same city progressed through the various stages of growth. So all that service is in one particular community.

But I know what it means in terms of budget impact for a tragedy of this type to occur. Mayor Cannon, I believe it was, emphasized that he was having to raise his tax rate.

Mr. **Cannon**. Yes.

Mr. **Vandergriff**. The other cities represented, for that matter, in the county. What is the potential budget impact? Could you, in deference to your time as well as ours, very concisely tell me the respective impacts?

Ms. **Whitmire**. I don't have a final estimate in Houston. We do think that the total cost of the repair and cleanup campaign will be in excess of $10 million. Assuming that we would receive a 75-percent reimbursement on all of those costs, then our budgetary impact would be something over $2.5 million for the city of Houston.

Let me say that there are some questions about that 75 percent that we have all thrown around. I know my colleague recommended that it be raised to 95 percent. He certainly has my endorsement on that proposal. Our brief investigation indicated that the 75 percent was not an item that was written into the legislation. Rather, that the legislation provided that there should be a substantial level contribution to the repair and cleanup effort.

Mr. **Roe**. If the gentlelady would yield at that point, you are absolutely correct. That is not in the law. That is a regulation.

I think there is another point that I would think is precursory to this whole operation, that there ought to be a credit offset, say for the services in kind that your communities have put in. In other words, when we evaluate those costs, which the gentleman is building up to, I believe that there ought to be a very clear, concise direction that comes back and says well maybe we can identify $10 million. But let's look, we might have another $6 or $7 million in services in kind that we ought to get an offset credit for, if I can make that point for what it is worth.

Ms. **Whitmire**. I appreciate that point. And I think there also should be some evaluation of the overall effect on the city. In the case of the city of Houston, not only are we in the grips of a severe recession with high unemployment, but we had a substantial amount of damage in May of this year from tornadoes that ripped across the north part of the city. We did not have any declaration of a disaster area, and so the entire cost of that cleanup campaign was borne by the city's budget.

On Monday of this week we had a severe flooding situation in southwest Houston which will cause us additional damage and cost to our city. We did speak with the Governor's office about the prospect of asking that the Federal Government increase the 75 percent, which has been a standard they have used for Federal participation in the case of our debris cleanup campaign because it is so costly.

We certainly want to urge that that be considered, because it is a very serious drain on our local funds.

Mr. VANDERGRIFF. Is it too early to estimate as to whether part of your response must be, as evidently in the case of Baytown, an increase in your tax rate?

Ms. WHITMIRE. We haven't, we have not proposed an increase in our tax rate at this particular time. I think if we had to address that, it would be more of a one-time assessment for storm damage, because we would not want to increase the tax rate. We did fortunately set aside a contingency reserve in our budgetary process. And we expect to again be reviewing that contingency reserve with the bond rating agencies.

The concern that I have about it is that, as you know, the municipal credit markets are very interested in seeing cities provide for contingencies. We have done that. But we are now looking at a situation which will substantially draw down that contingency reserve. And we are concerned about maintaining our high credit standing and the damage that might occur to our credit standing as a result of these disasters.

Mr. VANDERGRIFF. Thank you. Any other responses on that question?

Mr. WETZEL. Yes, sir.

I am from the city of Kemah, mayor pro tem, my name is Wilbur Wetzel. It is much more devastating for a smaller city because, for example, in Kemah, Tex., we had four operating businesses after the hurricane. Before the hurricane, we had 30. So you can see our income is mostly derived from the sales tax from these businesses.

And these businesses are still not in operating order. I think particularly 30 businesses in Houston wouldn't hurt Houston, but it killed us. I think you can readily see how the smaller cities with populations, say, under 5,000 at least, FEMA should come in with 90 percent or maybe 95.

Mr. ROE. If the gentleman would yield, you are making a very good point. I think one thing that is not taken into consideration, I think Mr. Huffman made that from Galveston, and so did Mayor Cannon, that you do not only lose the economic dynamics of an area, but you also lose considerable ratables. In other words, if whole areas are wiped out, these ratables are lost and, in effect, they go off your books at that point.

Mr. WETZEL. That is right. Several of the businesses are not going to rebuild. However, most of them are. But we have a lag time of 3 to 4 months before they will be in operation again.

Mr. ROE. Sure. There also should be, in evaluating any related percentile of participation, those issues ought to be taken into consideration as part of the economic whole rather than just specific odds and ends here and there. That is very important.

Mr. HUFFMAN. Mr. Chairman, if I may, in regards to that also, for example, first the Congressman asked if we would raise the tax rate. Yes, I proposed a tax rate increase in our city budget, city council. They had their public hearing this last Thursday. We will have one more next Thursday and hopefully adopt a budget.

My problem also is one, I think, that when we got our certified tax rolls, there was a lawsuit in 1980 that has finally been won by the banks that said we cannot tax the bank assets. So I lost $31 million in assets, or those taxable assets, in the Supreme Court ruling.

So now I am going to have to go back to them Monday. They will probably watch this night. I have tried to call most of them yesterday and let them know that the certified tax rolls do not include that reduction in the $31 million. So now we definitely are going to have a substantial tax rate.

To go one step further, since tax rolls have already been certified and those people have already—under Texas law, you can at a vote in that taxing jurisdiction, can prorate the taxes. My council did not do so, they wanted to keep it as it was as of January 1, 1983. But it is definitely going to affect us next year.

One, you have got a little more than 3 months before January 1, 1984, comes when the new assessed values come out. The majority of the people, even if they are starting to work on rebuilding their structures, will not make that point for them to be on the tax rolls at the total value they were before. Some of those businesses will not come back.

Also, if we should lose $56 million in assessed taxes next year, we would have to raise the tax rate by at least 4 cents to generate the same amount of money that we plan on generating this year. That is the kind of economic impact it has.

In the month of August of last year I received in sales tax $357,000. My payment came from Bob Bulloch's office, it comes usually the 15th day of the next month, so I received my August sales tax, I got $161,000. I am of this year substantially where I was last year in sales tax.

Now the other thing we have to take into consideration of all items, not just tax and sales tax, we also have franchise, you are getting ready to talk to Houston Light & Power people, we have a 4-percent franchise fee with Houston Light & Power. Last year we received $2,038,000. This year before the hurricane, which I had the budget put together and then have to go back and do my projections again, I am there with a projection of $2,445,000.

To give you a rough estimate, Houston Light & Power, that takes care of our electrical needs in Galveston, had electrical power off for the full island for at least 1 full day. It took them in some areas 2 to 2½ weeks to get some of the west end of the island back. They did an excellent job, they brought people down.

But I have lost 4 percent on the electrical fees. You can say that with Southern Union Gas, you can also say it with the other utilities. So it is going to have a tremendous financial impact on the city because they pay on the calendar year. Come February and March, when they start receiving those payments and if I have my projections too far out of line, I am going to be over budget and end up with a deficit.

Now, as mayor of Arlington, you sure hate to have your city manager project a deficit. It doesn't look good for you or your staff. But it is very hard to determine what those projections are going to be. We are a tourist oriented town. The majority of our sales tax, for example, did come from the tourist oriented people that are down there in the restaurants and hotels and shops and so on.

And we lose labor today. So with losing labor today, I am afraid to see what my sales tax for September is going to be. That is going to continue for a while until we overcome the problems. So overall, there is going to be a tremendous financial impact.

And my projections, we are going to be at least 3 years before the city even gets back to the normal financial projections they have had in the past, just to get them back, because they have been growing. Last year we issued over $54 million in building permits. This year in the first 10 months we had issued over $54 million in the first 10 months.

What will happen in the next few years, I don't know. That situation and all the ramifications of your revenues and projections, I am projecting we will probably spend out of pocket that we will not be reimbursed whether it is eligible on the 75 percent, I am talking about either the 25 percent or something that may not be eligible, anywhere from $250.000 to $500,000 that we are going to have to come up with out of our own budget.

So if you are going to have to pick up those expenditures and then the loss of revenues, it puts you in a very financial problem.

Mr. VANDERGRIFF. Well, you have dramatically illustrated that the after effects are going to be lasting and have tremendous impact.

Mayor Cannon, you are raising your hand. I appreciate that fact and will be happy to hear any other comments you want to make on that particular score. While you have the microphone, you raised an intriguing idea. The matter of restoring some of your public properties, parks and the like, trees needed.

Mr. CANNON. Yes, sir.

Mr. VANDERGRIFF. The Forestry Service entering into the picture. I found that most interesting. I would like you to expand just a bit. Is that an inquiry you have made, and you have found such a system is not possible?

Mr. CANNON. I will have to defer to Mr. Lanham. I don't believe we have made inquiry.

Mr. LANHAM. We have not inquired.

Mr. HUFFMAN. We have, Mr. Congressman. We sent a telegram, I have the greatest assistant in the world, Doug Matthews, who handles all this stuff. He sent a telegram in my name quickly to not only the National Forestry Service, but to our Senators and our Congressmen. Inquiry was made.

It came down through the National Forestry Service to the Texas Forestry Service. A man named Harry, I think it is spelled S-c-h-a-a-d, it is a very long name. I have it in my office. He has called me, and he has offered all the live oak trees that are necessary for us. He will be down next week to visit me and my staff to go over the planning.

He said you would have to hold them for a growing season, there will be a 3- or 4-foot live oak tree. He has other varieties of trees available. That is the Texas Forestry Service. The U.S. Forestry Service said they would like to, but try the Texas Forestry Service first, and they said they would help.

Mr. ROE. We have to hurry along, but let me offer you a suggestion. I am not going to cut you off, Mayor Cannon. I think that out of every meeting comes opportunity. It seems to me, I know that in the Department of Interior under the land and water conservation legislation, the Secretary has a contingency fund.

Wouldn't it be a nice effort on the part of the Secretary of the Interior to say to the great—no smiles now—to say to the great people of Houston and the State of Texas, isn't that a marvelous use of those kinds of contingency funds? That is what they are put in that bill for. That might be something you can jointly get together and importune the Secretary of Interior to be helpful.

We will look into that.

Mr. CANNON. Rest assured we will pursue it. What I was wanting to respond to, as far as the damages and budget impact in Baytown, we can firmly identify about $1.4 million out-of-pocket expenses. With 1.1 being in our current budget year, $300,000 in the following year, that is no in-kind services.

Of course, we have had two problems, I referred to Brownwood, of course this is wiped out. We are still having to furnish police protection in there because people have not gotten settlements from the insurance companies yet. So we have completely blocked that area off. We are having to—we have blocked it off to everyone but the property owners. So we are having police patrols in there. So this is getting to be a sizable expense for us.

I can't help but respond now. We talked about FEMA response in trying to speed the process up. I will not take exception, in some of these other areas we could use some help. But Brownwood, as such, all the agencies, I think they have very good response. This is a unique problem.

There is nothing left out—with Alicia occurring, happening on the 18th, we had our regular council meeting the following Thursday, the 25th. We had some official—Federal officials there. Then we had a town hall type meeting scheduled Sunday afternoon. That is some 10 days after.

All the agencies were there and were tremendously helpful. They had lots of answers. There were some things they could not answer, but I have never seen a governmental group try any harder than that group of men and ladies that afternoon in trying to answer people's questions. People just really didn't have all of their questions, but they were upset. They had been completely wiped out.

There was a previous program where there was an opportunity to close out Brownville, and it was not approved. So these people can see, you know, they are wiped out. And they were really upset. I can understand this. But all the officials that Sunday afternoon really tried hard, and I think they did a very commendable job.

We had a followup meeting Tuesday night then, and these same people came back down there, and I left the meeting at 10:30 or so, and they were still going strong. So we cannot fault the people that responded there. They did a very good job.

Mr. VANDERGRIFF. In the same general regard, I know we will have representatives from SBA later to talk to us. But while you who represent local governmental units are here, I know Mr. Sabota, and I would be interested particuarly whether the response of SBA in terms of loans, especially to the business community, to your knowledge has this been fairly prompt, fairly adequate. Are any of you in a position to make comments in that regard?

Mr. CANNON. I am not.

Ms. WHITMIRE. SBA had their representatives on hand through the disaster assistance centers, and to my knowledge, they were helpful in making those disaster loans. We have not had any complaints about their service.

Let me say quickly I want to apologize for having to leave. This has been very beneficial this morning, but I am afraid I am going to have to leave you and go on to other commitments for the day as we are trying to assess the damage of that flood in southwest Houston. But I have very much appreciated the interest you have shown.

Mr. ROE. Let me close on two notes. I think, No. 1, you folks have offered extraordinary help to us because now we have an ongoing case. We have other cases in the Nation. Now we can go back and say "Well this is what we have to be doing" and see what we can do to strengthen your position. I want to keep the dialog going.

I also want to compliment you for being really right on top of what happened. I think the public officials have done an extraordinary job in a very difficult situation. So we want to thank you for the input you have made. Thank you very much.

Now, like most hearings, we get a little bit behind because we get involved and are interested in the issues that are being developed, so we are going to have to tighten up a little bit. What we have decided to do is to call our two next witnesses together.

One would be Mr. Jack D. Greenwade, representing Houston Lighting & Power here, together with Mr. Jim Garland, chairman of Channel Industries Mutual Aid.

Also, the Red Cross. That would be Mr. Beall and Mr. Vessey. Why don't you all come up here.

I am sure you have prepared testimony, gentlemen.

The full text of your prepared statements will appear in the record at this point.

[Statements referred to follow:]

STATEMENT OF JACK D. GREENWADE, REPRESENTING HOUSTON LIGHTING & POWER CO.

For over 20 years, Houston Lighting & Power Company has observed the arrival of summer by holding interdepartmental meetings to review the company's Emergency Operating Plan, and, for over 20 years, we never had to put that "storm" plan into effect. We had something of a 20-year winning streak going for us, but 1983 brought an end to the streak. It actually ended in May, when numerous tornadoes struck across the northern and western parts of our system, leaving approximately 250,000 customers out of service. Restoration took approximately 6 days with outside help from Central Power & Light Company.

Three months later, on Thursday, August 18, at 1:40 a.m., the eye of Hurricane Alicia moved onto land approximately forty miles down the coast from Galveston near San Luis Pass and then meandered towards Houston. The path of destruction left by Alicia resulted in more than 750,000 HL&P customers without power. Between 11 a.m. and 12 noon on Thursday, August 18, the HL&P system load was at a level 15 percent of what it normally should be, 1350 megawatts.

As soon as the fury of Alicia had passed, field patrols began to report the damage figures to our company's Central Evaluation Center. Over 8,000 miles of electric power lines were not working and over 600 miles of line were on the ground. Approximately 40,000 customer drops were downed and nearly 2,400 poles were broken or uprooted. Almost every portion of the company's 5,000-square-mile service area was affected by the storm. The areas that suffered the most damage included Galveston, and cities to the south and east of Houston. Heavily wooded subdivisions in the Houston metropolitan area were also hard hit by the storm as trees and tree limbs fell on our power lines. Galveston was totally without power due to the loss of all the transmission circuits serving the island.

In the field, HL&P assembled probably the largest service restoration force ever put together by any utility in the country's history. He had nearly 2,000 of our own linemen restoring service, assisted by more than 1,000 other linemen from other utilities in the State and from private contractors. The other utilities that assisted by furnishing us crews included Central Power & Light, Texas Power & Light, Texas Electric Service Company, Dallas Power & Light, LCRA, the city of Austin, and Public Service of San Antonio. Over 1,000 tree trimmers were also called into service to remove trees from the lines. Our line crews worked around the clock on 14-hour shifts to restore service to three-quarters of a million customers who had lost power. One lineman lost his life during the restoration effort and another lineman was seriously burned after contacting high voltage power lines.

At the company's headquarters, in downtown Houston, two nerve centers operated 24 hours a day to process information coming in from the field. System Engineering personnel operated an evaluation center to analyze and disseminate information as to the status of the system. Our Public Affairs Department manned a news and media information center to issue reports to the press, radio, and TV concerning the progress of the restoration effort.

Low water pressure from the city of Houston system forced a loss of the building's air-conditioning system, as well as toilets and drinking facilities. Temperatures in critical equipment rooms reached as high as 115 degrees forcing the shutdown of some computer equipment and severely hampering our communication channels. Tank trucks were called in to bring water to the building and a special pumping system was established to get the air-conditioning back on to the critical equipment areas that needed it the most. Despite the adverse conditions, our customer service group handled over one-half million calls during the days following the storm while 3,000 experienced linemen worked as rapidly as possible to restore service. Every other qualified individual in the company was called upon to do what they could to assist in the restoration effort. There were approximately 5,700 other HL&P employees, from secretaries to managers, that were assigned important duties in support to our filled efforts, including evaluating damage, delivering food, identifying critical customers, answering phones, and assisting our crews by meeting face to face with customers in front of our line trucks so that the service restoration was not delayed.

Our game plan during the restoration effort was to make sure that the work we did put as many customers on as quickly as possible. To accomplish this effort sometimes meant that we had to make the decision to bypass a five-minute job that would restore one or two customers, in lieu of a five-minute job that would restore 200 or 300 customers. These were tough decisions, and sometimes resulted in adverse reactions from those that had to wait, but they were the right decisions. It took a total of 12 days for the restoration effort to be essentially completed and for Houston Lighting & Power Company to recover from what has been described as the worst electrical disaster to ever hit the United States. Until now, Hurricane Carla has been the yardstick by which the Houston Lighting & Power Company has measured storms. That will no longer be the case.

SYSTEM PURCHASING STATISTICS

Poles: 3,000 poles.

Crossarms: 4,000 wood crossarms.

Transformers: 4,500 pole-type transformers (25, 50, 75, and 100 kVA).

Wire: 3,950,000 feet of aluminum primary, secondary, and drop wire; 650,000 feet of aluminum tie wire; 1,034,325 feet of copper conductor; and 6,000 lbs. of copper tie wire.

Insulators: 26,158 insulators.

Protective equipment: 70 30-pole top switches, 250,000 fuses, and several thousand cut-outs, arresters, and combination units.

Meter sockets: 10,000 meter sockets (3,000 were from other utilities).

STATEMENT OF J. R. GARLAND, ARCO PETROLEUM PRODUCTS CO., CHAIRMAN, CHANNEL INDUSTRIES MUTUAL AID (CIMA)

BRIEF HISTORY AND DESCRIPTION

Industries and cooperating governmental agencies such as the U.S. Coast Guard, Civil Defense and various municipal fire departments in the general vicinity of the Houston Ship Channel maintain personnel trained in firefighting, emergency and first aid procedures along with the materials and equipment necessary to control any fire, explosion or other emergency situation of the type and magnitude which is most likely to occur in their individual location or area of activity.

In order to make a portion of this stockpile of trained personnel and equipment available to an individual industry or agency which may have an emergency situation which requires, or which may be expected to require, more manpower and/or equipment than the distressed industry or agency has available to combat the emergency, the CIMA organization was formed in 1955 under the name of "Houston Ship Channel Industries Disaster Aid Organization". This name was changed in 1960 to "Channel Industries Mutual Aid" (CIMA).

An emergency radio network connecting member industries and cooperating agencies is used to transmit and receive calls for aid and a manual lists manpower and equipment for efficient operation of the organization in the event of an emergency.

PARTICIPATING MEMBERS

1. 92 Industrial Companies.
2. Houston Fire Department.
3. Pasadena Fire Department.
4. Deer Park Fire Department.
5. LaPorte Fire Department.
6. Houston Police Department.
7. Harris County Sheriff Department.
8. Harris County Fire Marshal.
9. U.S. Coast Guard.
10. Port of Houston Fire Department.

TYPES OF EMERGENCY EQUIPMENT AVAILABLE FOR EMERGENCIES

1. Foam Pumper Trucks.
2. Aerial Foam Pumper Trucks.
3. Fire Fighting Foam Supplies.
4. Refinery Fire Fighting Specialists.
5. Chemical Fire Fighting Specialists.
6. Cargo and Warehouse Fire Fighting Specialists.
7. Emergency Rescue Equipment and personnel.
8. Air Breathing Equipment and Respirators.
9. Ambulances and Medical Personnel.

COMMUNICATONS EQUIPMENT

1. CIMA Radio (47.54)Mc.
2. Statewide Mutual Aid Radio (154.280)Mc.
3. Telephones.
4. Radio Equipment Includes Stationary, Mobile, and Hand Portable Units.

READINESS

Each participating member has a stationary CIMA radio manned 24 hours a day. Communication drills are held three (3) times daily. Each member is assigned; on a rotating basis, call duty for drills on a weekly schedule. During emergencies, the affected company assumes net work control for the duration of the emergency.

The CIMA organization has four (4) zones, each zone has a minimum of two (2) emergency preparedness drills each year. The organization also has one (1) CIMA wide drill each year. Listed below are some examples of drills:

1. Tank Fire Fighting.
2. Process Unit Fire Fighting.
3. Fighting Fires W/Foam.
4. Hurricane and Disaster Drills.

5. Liaison, Lectures, and Communications With Outside Agencies and Governmental Agencies Such As National Weather Agencies, Life Flight, Air Force Helicopter Group.

MEMBERSHIP REQUIREMENTS

Members are required to have enough fire and emergency equipment and trained personnel on hand to handle any ordinary emergency at their location. This is determined by an inspection and conference by CIMA inspection officers. His recommendation and a majority vote at a general membership meeting is then required. The member is inspected by inspection officers yearly and must attend general membership meetings and drills to retain membership.

MEETINGS

CIMA general membership meetings are held bi-monthly. Frequently, personnel from National Weather Bureau, Life Flight, Bomb Squad and other agencies are invited to attend and speak at these meetings. The CIMA steering committee meets bi-monthly, more often if needed, and provide direction for the organization.

CIMA OFFICERS

Chairman—Elected By Membership.
1st Vice Chairman—Elected By Membership.
2nd Vice Chairman—Elected By Membership.
Chairman of Steering Committee—Chair Fills Each Year By Outgoing Chairman.
All Remaining Offices Filled by Appointment By Chairman:
1. 5 Refinery Fire Fighting Specialists.
2. 5 Chemical Fire Fighting Specialists.
3. 8 Zone Representatives.
4. Recording Secretary.
5. Inspection Officers/Asst. Inspection Officers.
6. Drill Officers/Asst. Drill Officers.

The steering committee consists of CIMA officers, zone representatives, recording secretary, inspection officers, and one (1) delegate from each governmental agency, municipal fire department and volunteer departments.

SUMMARY OF ACTIVITIES BY RAY M. BEALL, DIRECTOR OF DISASTER SERVICES, GREATER HOUSTON AREA CHAPTER, AMERICAN RED CROSS

As Hurricane Alicia threatened the Texas Gulf Coast, the Red Cross activated its "Hurricane Watch Plan" and dispatched disaster equipment, supplies, and workers to assist local Red Cross chapters along the coast in their preparations for the storm.

At the height of the storm, 21,227 people sought refuge at 116 Red Cross shelters established along the coast and into North Texas. As most people were able to return to their homes following the storm, the majority of these shelters were closed by August 19. In Galveston and Brazoria Counties, however, shelters were open for longer periods in order to accommodate those families whose homes suffered significant damage and who had to obtain alternate temporary housing.

Because so many families were displaced or were without power, the Red Cross began immediate preparations for food service in the affected area. Operating out of as many as five (5) food preparation sites, over 400,000 meals were provided to disaster victims.

Red Cross workers also began immediately to assess the nature of damages suffered by families in the affected area. There were 18,600 families found to have suffered direct physical damage to their homes, and some twenty-five (25) percent of these were classified to be at least major damage. This figure does not include the thousands of families that suffered without electrical power for days.

By Monday, August 22, most families had begun significant efforts to recover from the storm. On that day, the Red Cross opened twelve (12) disaster assistance centers throughout the affected area to assist these families in their recovery efforts and to coordinate our efforts with those agencies operating in the FEMA disaster centers.

So far, 16,134 families affected by Hurricane Alicia have received direct Immediate Assistance from the Red Cross. This helping process has provided the means for families to obtain food, clothing, housing, emergency medical care and essential household furnishings.

The Red Cross is now phasing down its Immediate Assistance program and maintaining open communications with appropriate government agencies. We do this in order that we may anticipate the degee to which we will be involved in providing long term recovery assistance to those few families for whom government assistance is unavailable or inadequate.

Over five thousand Red Cross workers, most of them volunteers, have been involved in providing essential services to victims of Hurricane Alicia. All Red Cross disaster assistance is free and is provided by the generosity of the American public through their support of local United Ways and Red Cross chapters.

Recognizing that rapid urban development, subsidence, and potential global climate changes increase the vulnerability of the Houston area to future disasters, the Red Cross is preparing for increased disaster activity.

Hurricane preparedness requires the Red Cross to be prepared to deal with the human needs resulting from mass evacuations from coastal areas. Because hundreds of thousands of people may be affected by local government coordinated evacuations, it is essential that extensive planning and coordination occur with all responsible agencies, departments and organizations. The Red Cross stands ready to make its contribution to this effort.

STATEMENT OF ROBERT D. VESSEY

Mr. Chairman, I am Robert D. Vessey, National Director of Disaster Services, American Red Cross. With me is Ray M. Beall, Director of the Hurricane Alicia Disaster Operation for the Red Cross and Director of Disaster Services for the Greater Houston Chapter, American Red Cross.

We appreciate the opportunity to appear before the Subcommittee on Water Resources of the Committee on Public Works and Transportation. Mr. Beall will present a brief statement on Red Cross response to Hurricane Alicia.

The Federal Government, particularly FEMA Region VI, Texas State Government, local government units in Texas, and voluntary organizations in Texas have enjoyed close working relationships both on operations and in preparedness. That cooperation was evidenced in response to Hurricane Alicia.

We believe that response can be improved by adopting changes to the Disaster Relief Act of 1974 (PL 93-288). Changes have been proposed in HR 3430 pending before this Subcommittee.

The past two years have been extremely severe disaster years. The needs of disaster victims have placed heavy demands on the Red Cross as the nation's congressionally chartered voluntary disaster relief agency and on the other voluntary agencies with disaster-related programs. In our efforts to meet these human needs, our budgets have been stretched to the limit. The Red Cross has just completed a special emergency fund-raising effort to ensure our continuing ability to meet our legal and moral obligations to the nation's disaster victims.

Similarly, the demands and pressures on federal, state, and local government disaster-response agencies and programs have been great and came during a period when high unemployment, reduced tax revenues, and a variety of budget cuts and program retrenchments have strained state and local government resources and placed constraints on funding for needed hazard mitigation efforts.

As you know, the American Red Cross has been in the business of disaster relief for 102 years. Although the fundamental human needs created by disasters have not changed over these many years, the environmental circumstances under which the needs arise have changed many times over. In the nine-and-a-half years since the Disaster Relief Act of 1974 became law, the world of disaster preparedness and response has enlarged to include the accident at Three Mile Island and the problems created by chemical dumps such as the one at Love Canal. Additionally, dioxin has been added to the disaster lexicon in Times Beach, Missouri. We have seen the unexpected impact of the Mt. St. Helen's volcanic ash fallout on a technological and automotive society, and flooding caused by the melting of record snowpacks in Utah, Arizona, Nevada, and California. All of these new dimensions to disaster response have added to the challenges facing Red Cross Disaster Services and the Federal Emergency Management Agency (FEMA). Right now we are working with FEMA on a number of major earthquake and hurricane-preparedness projects in anticipation of disasters that may well be greater than any hitherto faced by the United States. The role of the American Red Cross in disaster relief was formalized by Congress in June 1905 and has been reaffirmed as recently as the Disaster Relief Act of 1974. The American Red Cross is also involved, as part of the League of Red Cross Societies, in international disaster relief efforts. This is part of our congressional mandate. The Red Cross works closely with government at all levels. Our role has been further defined in statements of understanding between the Red Cross and FEMA and in working agreements with other federal and many state and local units of government. During the 1981-82 fiscal year, the latest for which we have complete statistics, Red Cross responded to more than 43,000 disaster situations in the United States and its territories. We have, of course, welcomed the expanded role of government in providing disaster assistance, since it is no longer possible for agencies supported by voluntary contributions to meet more than the most pressing emergency needs of large numbers of people affected by disaster, although the Red Cross does meet the essential additional needs of disaster victims for whom government-funded programs are inadequate. For example, if funds provided to a family through the Individual Family Grant Program are not enough, that family is usually referred to the Red Cross for additional assistance. The Red Cross must be cost-conscious, as must this committee and the federal agencies involved in disaster. We have watched carefully the ways in which the voluntary sector interacts with the governments sector in disaster preparedness and response, and how the problems of government-program implementation impact on what we do. We have shared the frustrations of both federal and state disaster-agency personnel when things do not seem to work in the way those who created the programs and the laws that govern them intended. When programs falter or funds are inadequate, the ultimate sufferer is, of course, the disaster victim whose recovery is delayed or curtailed.

Perhaps the Red Cross has been in a unique position insofar as looking at and working with federal disaster programs are concerned. We are participating with FEMA and other agencies in efforts to streamline disaster assistance programs. As we testified in 1981, the Red Cross "applauds those efforts and the progress that has been made, but must temper our applause with concern that this progress not be slowed or even reversed by retrenchments in related programs or procedural changes that add to or perpetuate the burdens of disaster victims seeking help they urgently need." We want to express support for or concerns about proposals that are contained in HR 3430 in the hope that in the long run the legislation this committee and the Congress as a whole finally enact will expedite assistance for disaster victims. Specifically, our comments are as follows:

(1) In relation to Section 408 of the Individuals Family Grant Program, the Red Cross said in 1973 that we believe having this program administered by the states could produce fifty different programs that varied in their timeliness and effectiveness. This has proved to be the case in many situations. We said two years ago, and repeat again today, that the Individual Family Grant Program is still a long way from being a model of timely delivery of assistance to disaster victims.

Two summers ago, in Illinois, after flooding that occurred in mid-June, there was a long delay in implementing the Individual Family Grant Program because the state legislature has never appropriated funds for the state's 25 percent share of the costs. It was not until well into the cold-weather season that grant applications were being processed. Right now, in California, processing of grant applications made by victims of the February floods and tornadoes is still going on at a slow pace. (By contrast, after the Fort Wayne Floods, the Red Cross—which has a contract with the state of Indiana to do the casework related to this program—completed all the applications and submitted them to the state for review and payment in about three weeks.

After Hurricane Frederic, in 1978, it took the states of Alabama and Mississippi as long as 18 months to complete the processes involved in issuing grants.) From the perspective of the victims, the long delays in implementing the grant program are frustrating and demoralizing. From the perspective of the Red Cross, the long wait until we know what additional Red Cross help the family may need, beyond the grant, increases administrative costs of keeping staff available in the field, and often creates a requirement for interim assistance that might not have been necessary if the grant procedure had been timely. We know that this is also distressing to FEMA, which is working to create a faster combined application and verification system that could expedite service delivery. The Red Cross is involved in the development of that system.

As a result of direct experience with these problems, the Red Cross strongly supports proposed amendments to the Disaster Relief Act of 1974 that would provide incentives in the form of a 50 percent reimbursement to the states for administrative costs—over and beyond the 3 percent presently allowed—for those states that complete the Individual Family Grant Program in a timely manner. In light of the budgetary problems many states seem to be having today, we believe this incentive will help improve the way in which the program is carried out, especially if the grant program is closely monitored by FEMA to ensure timely and effective administration.

(2) Further, we believe that the ceiling on the amount of money available to applicants should be raised from its present $5,000 limit to at least $7,000. The current limit has not changed since the program was written into law in 1974, although the costs of rebuilding and of replacing household contents, for which federal grant funds are authorized, have risen considerably in the intervening nine years.

(3) As an organization involved not only in disaster preparedness and relief but also in supporting efforts at hazard mitigation, we support the proposed amendment "Recovery of Funds" (Sec. 316), which would authorize the Attorney General of the United States to seek reimbursement of federal expenditures from parties whose acts of commission or omission led to the need for a Presidential Declaration of an emergency or major disaster. While this has obvious implications in situations involving man-made disasters—such as nuclear power plant accidents or chemical spills—it could also provide the basis for action against political entities whose elected or appointed officials knowingly permitted residential or other development in know flood or earthquake or other hazard areas. The possibility of such legal action and fiscal penalty might be the deterrent that has been missing so far in the effort to mitigate losses caused by unwise utilization of potentially hazardous areas.

(4) In relation to hazard mitigation, we also support the amendments to Section 406, which would authorize federal participation in the cost of implementing recommendations made by hazard mitigation teams following a disaster. While this is a relatively new aspect of the federal disaster response, we share with FEMA the concept of seeking ways to make communities safer following the disaster, so that additional suffering and cost can be reduced or ameliorated. Unfortunately, many states and communities lack the financial resources to implement such recommendations. Cost-sharing by the federal government could increase the practicality of post-disaster hazard mitigation and, in the long run, save the taxpayers more than the initial investment.

In this connection, incidentally, we want to reiterate our previous statements before other committees in support of the National Flood Insurance Program (NFIP). If kept affordable for flood plains residents, and if its flood hazard mitigation elements have adequate funding, the NFIP can be a major force for flood-loss reductions.

(5) HR 3430 substantially alters Section 404 of the Disaster Relief Act of 1974 by eliminating the presently provided one year's rent-free temporary housing and substitutes a program based on the financial ability of the occupant to pay all or part of the cost of such housing. As we testified in 1981, the Red Cross agrees that the existing program may have provided rent-free housing to many disaster victims who could have paid all or part of the rentals involved, but we want to reemphasize the importance of the words, "to take into consideration the financial ability of the occupant." How this phrase is implemented is the key to equitable provision of temporary housing. We urge the committee to include in the amendment the specification that an adequate system be devised to determine the ability of the occupant to pay based on his post-disaster rather than pre-disaster, financial situation. This would help ensure that disaster victims are fairly treated and that all other financial obligations are truly considered.

(6) We support changing current legislation in order to give the President the right to designate a Federal Coordinating Officer (FCO) in undeclared emergency or disaster situations. While the Red Cross response, including availability of supportive federal programs, does not depend upon a declaration, there should be in many instances an FCO on site who can begin planning for federal agency actions and who can coordinate such actions. as are initiated even in advance of a Presidential Declaration. Three Mile Island is a good case in point; federal support for evacuation planning was minimal during the critical period. We believe also that the proposed definitions related to emergencies and major disasters should be expanded to include nuclear accidents and chemical spills. The proposed definitions also include fires and explosions, either of which could lead to nuclear accidents and chemical spills, but would exclude situations such as Love Canal and Times Beach where neither a fire nor explosion was involved.

(7) We urge, too, that the Subcommittee look carefully at the proposed new limits on the availability of unemployment insurance for disaster victims. Considering the history of plant and business closing down permanently as the result of disaster and the current high rate or unemployment generally—it seems to us that arbitrarily limiting disaster unemployment insurance to other existing unemployment insurance programs may make sense in one locale but not another. Consideration should

be given to how this is implemented and whether it would add a fiscal hardship to the state government whose unemployment insurance funds are already depleted.

(8) We are concerned about the proposal that assistance for the repair of disaster-damaged properties owned by nonprofit institutions be reduced to a maximum of 75 percent of the projected costs of repair or rebuilding. It should be kept in mind that nonprofit agencies—be they hospitals, schools, clinic, libraries or, for that matter, Red Cross chapters—seldom have reserve funds available for capital expenditures. Having to come up with the needed 25 percent of construction and replacement costs could force many agencies in the voluntary sector to reduce services, services that communities need as government funding for health and social service shrinks. We urge retention of 100 percent funding of such repairs or replacement of facilities for nonprofit institutions.

(9) Earlier we mentioned the fact that the Red Cross assisted the state of Indiana in implementing the Individual Family Grant Program. The Disaster Relief Act of 1974 and the proposed amendments (Sections 403 and 503) provide for the government to distribute food, medicines, and other supplies through the Red Cross. We recommend this be expanded to include provision of "other services to disaster victims", so that, if desired, the Red Cross could be asked, on a reimbursable basis, to implement parts of the Individual Family Grant, Temporary Housing, and other programs. Our experience is that the Red Cross could thereby help expedite the delivery of services to disaster victims inasmuch as we are already on the job determining the needs and resources of many of the victims. Much of the information already being gathered could easily be transposed into government program applications and a total assistance package developed for review and action. This would speed service to disaster victims and help the Red Cross to contain costs.

There is ample precedent for the government to utilize the resources of the Red Cross in this way. During the Indochinese and Cuban Refugee projects, the Red Cross undertook to provide support services under partial cost-reimbursment contracts with the federal agencies or task force involved. Currently, the Red Cross is a participating agency in the emergency food and shelter programs established by the Congress in PL 98-8. Red Cross Disaster Services has had other contracts with FEMA. In each instance, the government was utilizing the expertise of the Red Cross, with the Red Cross accepting reimbursement because the specific actions being performed were outside the normal disaster programs for which public contributions are sought and given.

This has been a long statement, Mr. Chairman, but it has been necessarily so because we want to share with the committee all of our concerns about the needs of disaster and how they will be met under the proposed amendments. We thank you for the opportunity to share our concerns with the committee and are available now, or later, to answer any questions the committee members or their staff may have. Thank you again for the opportunity to be with you today.

Mr. ROE. Please proceed.

TESTIMONY OF JACK D. GREENWADE, HOUSTON LIGHTING & POWER; JIM GARLAND, CHAIRMAN, CHANNEL INDUSTRIES MUTUAL AID; RAY BEALL AND ROBERT VESSEY, AMERICAN RED CROSS

Mr. GREENWADE. Mr. Chairman, you have heard comment all morning long about the area we live in and its instance of storm-related damage. I would like to try to put in perspective the magnitude of the problem we faced in this community, our communities.

You are aware the storm hit on August 18. The storm stayed in our general service area, which encompasses most of the city you have heard from today, all of the city, for approximately from the early morning hours, 1:30 to 2 o'clock in the morning, until 2 or 3 o'clock in the afternoon that same day.

The height of the storm, as far as we were concerned, as to damage occurred approximately around noon that day. At that time we had just sustained the bulk of the damage to our system. That damage consisted mainly of distribution circuits and transmission lines. We, in fact, only had one tripping of a generator during the storm, and that occurred from debris that was blowing in from offsite and some switch gear and resulted in trip of a unit. At the height of the storm, we had 569 circuits out of service.

We have approximately 160 transmission lines composed of 69,000 volts and above, up to 345,000. Seventy-two of those lines were out of service at the height of the storm. An electrical disaster of that nature is unprecedented in our country; for that matter, maybe in the world.

The blackout, as you recall, in New York was a major electrical disaster. It took 4 days to restore that service approximately, if I recall correctly, and they sustained no physical damage to plant in that process.

The two previous hurricanes that I dealt with, Carla, hitting our area, and Celia, hitting Corpus, were devastating hurricanes. In Carla Houston lost approximately 450,000 customers. It took us at that time somewhere in the neighborhood of 6 weeks to completely restore service. Again, with help from all of our neighbors.

When Celia hit central power and light system, we sent crews to aid them. We had our crews in their service area for over 4 weeks in their restoration period. To my knowledge, the restoration effort in this storm is unsurpassed in our history.

We amassed a larger work force than has ever been amassed to restore electrical service. We had approximately 3,000 linemen or linemen-type individuals restoring service, physically climbing poles, setting poles, hanging wires, et cetera. Two thousand of those are our own force, over one thousand are people we brought in from outside.

The problem with bringing people in is logistics. All of our systems are different; we used different voltage levels, used different operating practices. Not radically different, but different to the extent that people from one service area coming into another need to have proper supervision from a safety standpoint, from a reliability standpoint, from an operating standpoint.

We stretched our supervision in our opinion as far as we could stretch it in putting our people with foreign crews that were brought in to restore this service. They did an admirable job, a job in my opinion unsurpassed elsewhere.

Twelve days after the storm, the system was back intact. That did not mean there did not exist individual customers out of service. There obviously are. When houses are destroyed, obviously you cannot restore service until the people who own the facilities do something with it.

But the facilities we maintained were back in service within 12 days. The bulk, remainder, of our work force, some 6,000 to 8,000 people, provide those logistics. Food to the workers in the field who were on a 24-hour basis, around the clock. Material amassing, et cetera.

We have what we call an emergency operating plan, a storm plan, that our company has adopted since Carla in 1961. That plan was filed with the public utility commissioner in the State of Texas. The plan is reviewed on an annual basis to make sure the people involved are knowledgeable. That plan was in fact put into effect in May on a limited basis, when the tornado Mayor Whitmire referred to swept through our service.

They hit a large portion of our service area. We had 250,000 customers out in May. That restoration service, again assisted by central power and light crews at that time, took 6 days to restore service. The damage sustained primarily in these two storms, tremendous damage, wind damage, facilities literally knocked down. There is a more detailed report in the statement.

Prior to the storm and as the mayor pointed out, 3 or 4 days before the storm, everyone still thinks it is going somewhere else. But we start our procedures about that timeframe, when we check what material we have on hand, what stores can supply us, where the high ground is.

We have experienced people familiar with high water and the problem of having Galveston cut off, prior to this storm we put transmission crews, substation crews, additional crews, material and equipment on the island in the event it was cut off so we would have those people there.

Similarly we amassed equipment and material before the storm on high ground in the Clear Lake area and low-lying coastal areas so we would be prepared for whatever occurred. Basically, those are the comments I would like to make, in essence, of time.

Mr. ROE. Thank you.

Mr. Garland.

Mr. GARLAND. First, sir, I would like to put the CIMA organization in its proper perspective so perhaps everyone here would understand what CIMA organization does. I have heard the word "FEMA" all morning. We are not FEMA; we are CIMA. That is Channel Industries Mutual Aid, which is made up of 92 industrial companies and the city of Houston.

The CIMA organization was formed in 1955. All these agencies have radios manned 24 hours a day with backup batteries and generating equipment to keep these radios operating in case of an emergency, in case of blackouts and whatever. Much equipment is available to people that might be affected by a disaster, fire, explosion, hydrocarbon spill, or whatever.

Types of equipment we have on pumper trucks, aerial pumper trucks, fire-fighting foam supplies, refinery fire-fighting specialists, chemical company fire-fighting specialists, cargo and warehouse fire-fighting specialists, emergency rescue equipment and personnel, air breathing equipment and respirators, ambulance and medical personnel; all this is available on call.

That describes my organization, our participating members, it describes equipment and whatever that we have. I think probably I should throw it open to questions.

Mr. ROE. Mr. Beall, and Mr. Vessey, who will now speak for the Red Cross.

Mr. VESSEY. We would both like to, Mr. Chairman.

I am Robert D. Vessey, national director of disaster services, American Red Cross. With me is Ray M. Beall, director of the Hurricane Alicia disaster operation for the Red Cross and director of disaster services for the Greater Houston Chapter, American Red Cross.

We appreciate the opportunity to appear before the subcommittee—Mr. Beall will present a short statement on the hurricane response, on the Red Cross response to Hurricane Alicia.

Mr. **Roe.** Mr. Beall?

Mr. **Beall.** Thank you.

The Red Cross, fortunately being a volunteer agency, enjoys the freedom and flexibility to do a lot of things before the hurricane hits. Obviously, we do not have to wait for Presidential declaration or other governmental actions.

As far as our own ongoing activities is to organize a hurricane watch plan so that when a hurricane enters the gulf and threatens the coast, we send predesignated people, equipment, vehicles, supplies, to areas, chapters along the gulf coast to assist in preparations for shelter activities, feeding activities, those kinds of things the Red Cross is involved in.

Hurricane Alicia was no exception, although Alicia fooled us a little in that it gained strength quickly and hit us sooner than we anticipated. We had nevertheless significant resources already stationed along the coast.

Something over 20,000 people sought refuge in our shelters. We entered the second phase where we began to deal with the families on a more individual basis to provide what they may need for their recovery. We opened as many as 12 different assistance centers. Some of these were in conjunction with the FEMA centers. Most, however, were separate operations, even though we do coordinate and communicate quite closely with the FEMA coordinating relief agencies. We still have several of these centers open; and so far have assisted over 16,000 families who suffered losses as a result of the hurricane.

We did this with approximately 5,000 Red Cross workers, most of whom were volunteers. Some 150 are still on the job today.

Mr. **Roe.** Mr. Garland, you expressed the order of magnitude of your operation. I think the communication system is of vital importance. Was it called into use?

Mr. **Garland.** Sir, it is in use 24 hours a day. It is the CIMA radio network. Each of the participating members and agencies has these type radios. They are stationary, mounted in their plants, locations or agencies or offices and manned 24 hours a day.

Mr. **Roe.** So there is a constant intercommunication system?

Mr. **Garland.** Yes, sir.

Mr. **Roe.** That concerned me a little when Mr. Greenwade was speaking on the point of view that, if we are dependent upon powerlines and telephone lines. You do have a radio communication system?

Mr. **Garland.** Yes, sir. We find them very useful. We have a—backup batteries and portable generating equipment to power the radios in case of a power failure.

Mr. **Roe.** Mr. Greenwade, what happened in Galveston?

Mr. **Greenwade.** What happened in Galveston?

Mr. **Roe.** Yes. They seemed to be out a little longer than others.

Mr. **Greenwade.** They were the most devastated physically as well. The island was in fact totally blacked out. We lost all transmission to that island at the height of the storm.

Mr. **Roe.** Are there auxiliary lines to the island? Is there power generation on the island?

Mr. **Greenwade.** No, sir.

Mr. ROE. Are there auxiliary lines to the island, or is there just one main cable?

Mr. GREENWADE. There are more than one transmission line to the island.

Mr. ROE. Are they interchangeable? Can they feed each other?

Mr. GREENWADE. Certainly. Yes, sir; but they were all out of service.

Mr. ROE. Should there be an underground line put in there?

Mr. GREENWADE. Should there be? In my opinion, no, sir, there should not be. The expense of that, and compared to the amount of outage, a storm of that magnitude for the period of time that the total power was out to that island, the cost of putting underground major transmission to that island would be prohibitive. The power was restored to that island late that night, Thursday night and Friday morning, and we began to pick it up.

The critical issues were water. Water pressure and the water system to Galveston are served by pumps on the mainland. Those lines were also out. We had transmission crews working around the clock to put those pumps back on.

Mr. ROE. Again we are so desperately short of time. As we start to look for answers. I happen to think energy is crucially important.

Mr. GREENWADE. So do we.

Mr. ROE. From the point of view of the water supply, hospital systems, some, of course, you can have emergency standby generators. But it would seem to me, not to press the point, that we ought to take a look at that because there are certain critical elements of the infrastructure—we were fortunate not to have been out longer. So that could be looked at, couldn't it?

Mr. GREENWADE. Certainly. We in fact do that. The problem with just making an underground transmission line to Galveston, the rest of the system backing that transmission line up was down, also.

Mr. ROE. I understand.

Mr. GREENWADE. That didn't gain anything totally. But the priorities we do establish are those essential services.

Mr. ROE. Mike.

Mr. ANDREWS. Thank you, Mr. Chairman.

Just one or two brief questions because we're running out of time. We came so close to a real disaster. We had a disaster. We had a 3.5 hurricane. Had we had a 4 or 5 it is almost hard to comprehend the immensity of the problem.

Mr. Garland, in view of that I would like you to comment on your agency's ability to respond. I mean as per manpower, budgetary problems, your ability to respond if in fact we find ourselves faced with a more severe hurricane.

Mr. GARLAND. Sir, the CIMA organization is set up, as I said before, of participating members. Each of those participating members must have trained personnel, equipment, written emergency and disaster plans, sufficient to take care of their ordinary needs at their location or their agency. If they have more problems or larger problems than what they can handle with their own equipment and their own personnel, then they call the CIMA organization in for help, and they can get as much help or as little help as they need.

Sir, were you talking about our ability to move fire equipment and ambulances on the highways during the storm, high water and high wind? If you were, it would be very difficult to move it, naturally.

Mr. ANDREWS. How did the refineries respond along the channel? Are you as a group satisfied that they followed correct procedures in terms of shutting down?

Mr. GARLAND. Mr. Andrews, we had one CIMA standby alert from one of the participating companies. They had a problem——

Mr. ANDREWS. Was that the Exxon plant?

Mr. GARLAND. No, sir. They were able to handle the problem with the equipment they had.

Mr. ANDREWS. There was an interview and report in the August 25 edition of the Houston Post in which some Texas city employees that were at that Exxon refinery, one of them said they were going full blast. If one of those units had gone, there would have been 100,000 barrels of flaming liquid blown by 100-mile-an-hour winds.

How close did we come to that kind of disaster in Alicia?

Mr. GARLAND. Mr. Andrews, the CIMA organization only had the one emergency alert, and that was just a standby alert. That was all we had.

Mr. ANDREWS. Would you care to comment on that?

Mr. GREENWADE. If I can. I am not familiar with that particular instance that you refer to. What we did prior to the storm with the industries we serve, major industries, we had prearranged with them how they would be loaded during that time, recognizing that still there was an uncertainty as to where the storm would be. They are in business as you well know. So they were concerned about a complete shut down.

We, also, as you are well aware, some of our larger industrial customers maintain their own substation and are served at transmission level voltages. We did, in fact, change relay settings so that should those substations become inundated that we would be able to operate the total electric system and maintain the overall integrity of the electric system.

Mr. ANDREWS. What changes will HL&P make in anticipation of future hurricanes? What kind of warning systems? What internal changes can you suggest to us that, on review of Alicia and your response, you will enact as we anticipate future storms?

Mr. GREENWADE. Mr. Andrews, we are still in the process of evaluating how well we performed and what things we would do differently. Certainly in any operation things can always be improved. We believe that our people demonstrated with the help of our neighbors, as I said before, an unprecedented recovery. We had 750,000 customers out, over 8,000 miles of line out of service and over 600 miles physically down in people's backyards; unfortunately, not on streets where you could get equipment in to do it. A lot of the work had to be hand done.

To answer your question about what we intend to do, we intend to do exactly what we have done following each storm: evaluate the performance of our people. Not only ourselves, but we have asked those people as we have always done that came to assist us, Central Power & Light, Texas Utilities, all three, their companies were here, Texas Electric Service, Dallas Power & Light, TP&L, the LCRA sent people to us, San Antonio sent people, city of Austin sent people. We had a force from all major utilities.

We have asked them to critique what they observed while they were working with us. We do not have that information yet. But we continue to upgrade the plan, as I mentioned earlier, on an annual basis and review it prior to primarily the hurricane season.

One thing we learned in May was that we better not wait for the hurricane season to hit us. Tornadoes could be systemwide and devastating, and we need to look at our emergency plan from that standpoint, not just hurricanes.

I cannot answer your questions directly as to what steps we intend to take on the next storm. We believe the procedures we have established now are the proper procedures. How we can refine and improve those procedures is what we are going to be trying to do, and we do not know yet.

Mr. ANDREWS. I have no further questions this morning.

Mr. ROE. How about Congressman Vandergriff?

Mr. VANDERGRIFF. I wish time allowed for us to ask many questions. For now I will confine myself to simply one more question. Perhaps I ought to direct it to our friends from the Red Cross.

Years and years ago we used to depend to some extent on evacuation drills. Are we too complex, too large now, as to make this impractical? The reason I direct the question to you is that I can recall that when our city did this, the Red Cross was very active in assisting us in those exercises. What are your thoughts on that subject?

Mr. VESSEY. No, I don't believe we are too complex or too big. It is a problem that requires great cooperation between governmental units. Obviously on the Texas gulf coast that presents bigger problems. But I think this State, the State of Texas and the local government units and the voluntary organizations in Texas, of which there are many, have a long history of cooperation and preparedness. I think they need the support to continue those efforts, but they have done a good job and, obviously, they can do more in planning.

But the key is the intergovernmental cooperation and the cooperation between the voluntary sector.

Mr. VANDERGRIFF. Thank you, sir.

Mr. VESSEY. Mr. Chairman, could we draw your attention? I know in the interest of time the committee has a lot of work to do. But in our testimony we made some comments on the H.R. 3430 that is pending before your subcommittee and before the overall committee of the House. We drew some specific comments because we believe that there could be a better response on the part of the Federal Government to the State and to the local community if some of those things mentioned in that law were given serious consideration in the subcommittee and in the House as a whole.

We invite your questions and comments after you have had the opportunity to read our testimony.

Mr. ROE. Well, we agree. I haven't had a chance but I will, I assure you. I think one of the most telling points you have made is that you are practically one of the very few agencies of national recognition. You know, a whole history of what great works have been carried out by the Red Cross, that can move and prepare in advance because you don't need the declaration. I think that that is a very telling point and a very important one.

Some kind of coordination I would think with your types of organizational structure and efforts should be locked in so that Federal and State agencies can kind of parallel what you are doing as these things present a possible problem. So I think that, and I want to thank you for what you have done for 16,000 people here. In candor, one must come back and say that when government works, it needs 10,000 applications. When the Red Cross works, they worry about the applications later.

So you support a great need for our people and we appreciate that. We want to thank you all. Don't consider the lack of time to be lack of attention. I think that we were able to stress that, yes, we do have a radio communication system which is viable and very important.

I don't think the power company has to be too defensive. In my judgment, what I have seen of what happened along the New Jersey shore, it has taken us weeks to get back—I shouldn't say that. But you have done a superb job. Again, with the situation on the tornadoes, perhaps that was an omen in advance which had you better prepared.

We want to thank you very much. We will review your testimony. There will be some written questions, as Congressman Andrews pointed out. If you would be kind enough to answer, we would really appreciate it, because it will be helping us.

Thank you very much.

We are now going to request that all of the Federal agencies that are here this morning to please come forward. That would be the Federal Emergency Management Agency represented by Mr. Joseph Winkle, Assistant Associate Director for Disaster Programs, accompanied by Mr. Robert Broussard, Federal Coordinating Officer, Hurricane Alicia, and Mr. Donald Collins, Assistant Administrator for Federal Insurance Administration. If he could be joined by Mr. George Darby, Director, Disaster Area 3, Small Business Administration, and also Col. Alan Laubscher, Commander of the Galveston District of the Corps, and Environmental Protection Agency, Mr. Dick Whittington.

We also had listed a representative for the State emergency agency. Are there any representatives for the State emergency organization here this morning? Would you mind coming forward, sir, and could you give us your name?

Mr. LANSFORD. Robert Lansford.

Mr. ROE. Again, gentlemen, thank you for being with us. All of your formal statements will appear in full in the record, but it would be helpful if we had an overview and a summary. Because I know you have been working together and there is an interrelationship, interfacing basically of your efforts. On that basis suppose we call upon FEMA first, Mr. Winkle.

The full text of your prepared statements will appear in the record at this point.

[Statements referred to follow:]

STATEMENT OF JOE WINKLE, ASSISTANT ASSOCIATE DIRECTOR, DISASTER ASSISTANCE PROGRAMS, FEDERAL EMERGENCY MANAGEMENT AGENCY

Mr. Chairman, thank you for inviting me to testify today on behalf of and concerning the Federal Emergency Management Agency and its role in disaster relief. Let me begin by outlining those measures taken to date regarding the damages in this area, and then touch on FEMA's role generally in acting as a coordinator and in supporting preparedness programs designed to reduce the impact of future disasters.

The Disaster Relief Act of 1974 (Public Law 93-288 as amended) authorizes a wide range of Federal help in major disasters or emergencies declared by the President. Substantial assistance may be provided, as appropriate, according to the particular characteristics of each disaster, including Public Assistance to State and local governments for the repair and restoration of publicly owned and certain private, non-profit facilities, and Individual Assistance which may include temporary housing, grants to address certain disaster-related costs, and disaster unemployment assistance. It should be noted at this point that a basic requirement for the Disaster Relief Act is that Federal assistance may be authorized only when it is necessary to supplement the capabilities of the State and local governments in coping with a major disaster.

On August 19, 1983, the President declared a major disaster for the State of Texas due to damage sustained as a result of Hurricane Alicia. Individuals and families in nine counties are receiving assistance, and aid to local governments is currently being made available in eight counties.

In the area of public assistance, FEMA has received 1262 Damage Survey Reports, reflecting a total amount of approximately $23,350,000 of which debris removal constitutes about $20.5 million. A major portion of the damage occurred to facilities of private, non-profit electric cooperatives, which are eligible for public assistance under the terms of the Act.

Approximately 15,500 registrations have been filled out at the Disaster Assistance Centers. All the major programs to assist individuals and families have been activated to answer these peoples' needs, including Temporary Housing, the Individual and Family Grant program, and Disaster Unemployment Assistance. In addition, both the Small Business Administration and the Farmers Home Administration are providing further assistance to individuals under their own authorities in cooordination with the FEMA programs.

Some new procedures in program administration are helping improve the rate of delivery for some of the assistance. A new computer system in the Temporary Housing program has greatly streamlined certain elements, especially relating to the minimal repairs area. Also, FEMA has instituted procedures which have cut about two weeks out of the processing time for checks from the U.S. Treasury.

The National Flood Insurance Program administered by FEMA has been another major element of the Federal response to support and assist the recovery of those areas damaged by Hurricane Alicia. This program not only insures against potential losses but also, in conjunction with flood plain management and local zoning practices, helps minimize the risk of future damages. The parts of Texas most seriously affected by Alicia are recognized as being at high risk to the flooding associated with hurricanes and other severe storms. For that reason, the Federal Insurance Administration has historically been quite active in this area. The benefits are seen in the large numbers of people who were protected by policies.

As soon as the storm had subsided, personnel began to establish large scale operations to address the high volume of claims. The NFIP's flood insurance claim office is located in Clear Lake. For each claim an adjuster must be assigned. Usually, this will be someone from a private sector independent claims adjustment firm. The adjuster must, as for any insurance claim, personally verify damages, consult with the policy holders to assist them in assembling necessary documentation for proof of loss, and submit a report giving an estimate of the damage. A second visit with the policy holder completes preparation of the claim which is then ready for processing upon receipt by the NFIP of the policy holder's proof of loss. Many cases are concluded following the adjuster's first visit.

While local difficulties with communications networks at first limited the level of activity, the NFIP has in place a claim examining workforce capable of processing 400-500 cases daily. To date there have been 11,466 claims. As of 9/21 final payment has been made on 566 cases (with advances paid to a great many more); 356 cases have been closed without payment, either because the damage was below the deductible or else was covered by other insurance (we should note that much damage has actually been determined to be wind rather than flood related and thus often reimbursable through other homeowner insurance). That leaves a total of 10,544 cases open.

Now that the intitial time consuming phase of preparing and submitting the claims is being completed, we anticipate a rapidly increasing rate of pay-out and closing.

This disaster also presents an illustration of how these numerous programs work together. The Brownwood subdivision of Baytown received considerable damage and remains a serious hazard. FEMA is working diligently with local officials and residents so that by combining flood insurance claim payments made in reimbursement for the actual physical damage sustained by the insured along with other funds, from our 1362 program, allocated for the purchase of flood prone properties, individuals may be reimbursed for fair market value of their property and relocated out of the high risk area. The potential for future damage is such that this approach clearly will be cost-effective. This type of approach is applied when our hazard mitigation efforts would not be a realistic solution.

Another primary element of FEMA's involvement in Federal disaster assistance is as a coordinator. Through the Federal Coordinating Office, FEMA facilitates and supports the joint relief efforts or other Federal agencies, State and local governments and voluntary relief organizations. It must be noted that FEMA has neither the authority nor expertise to administer or direct the programs of other Federal agencies. The coordinating role of FEMA involves a responsibility to ensure that the appropriate measures of assistance are brought into play, and coordinated to prevent unnecessary duplication. However, while FEMA acts as a coordinator, it does not assume the specific technical responsibilities of the other agencies involved.

Title II of the Disaster Relief Act authorizes measures to improve preparedness at all levels in anticipation of disasters, so that possible damages may be lessened or avoided altogether. The two chief tools in this effort are the Disaster Preparedness Improvement Grants made to State governments, and an ongoing emphasis on hazard mitigation. The preparedness grants provide a maximum of $25,000 per year to be matched equally by the State. These limited funds serve a variety of purposes, including the following:

Preparation, revision and updating of State Emergency Plans;

Handbooks for local officials;

Preparation and updating of vulnerability analysis;

Inprovements to administrative guidelines for the Individual and Family Grant program and the Temporary Housing program;

Tests of warning and communications systems;

Review of county preparedness plans, and the provision of technical assistance to local planners; and

Development of plans and guidelines for pre-disaster hazard evaluation and mitigation planning.

We would note that this program specifically addresses State level preparedness. The history of the program has proven its worth in an improved level of capability on the part of States to respond to potential or actual disasters. FEMA hopes to provide even greater support to this program in the future through increased financial assistance.

Hazard mitigation represents an approach to disaster relief management that examines the measures that may be taken to build up resistance to certain predictable types of damages from natural hazards. Especially in flood prone areas, the involvement under the Disaster Relief Act involves planning and technical assistance for States, as well as—pursuant to a Major Disaster Declaration—direction on ways that the repair, restoration and reconstruction of public facilities can include measures to reduce future damages. At present, limited disaster proofing may be funded for damaged or destroyed facilities provided that the proposed work is otherwise eligible under Public Law 93-288. Other structures in the same area that may not have been damaged in a given disaster but remain highly vulnerable are not currently eligible for such assistance. Also, under current authorities, FEMA seeks to reduce future damages by pursuing these principles though three other channels. First, hazard mitigation teams coordinate the Federal response to assure that actions being taken by various agencies contribute wherever possible to hazard mitigation in a coordinated manner.

Second, Section 406 of the Act requires as a condition of assistance that States take actions (for example, concerning land use or construction practices) that will help reduce future losses. Finally, under Executive Order 11988, FEMA has oversight responsibility to insure that all Federal agencies avoid taking actions that would create vulnerability in the flood plain, or, if actions have no alternative location, to insure that agencies make appropriate accommodations to minimize potential impacts.

We believe that all these programs have demonstrated their value. They hold the promise of significantly reduced future damages and correspondingly reduced Federal disaster relief costs, requiring a relatively low initial investment by the Federal Government. As a measure of our support for this effort, FEMA has submitted proposed legislation which, among other things, provides for a doubling of the Preparedness Grants. Also, for the first time it authorizes direct funding of hazard mitigation measures which would be cost-effective and would result in significant risk reduction. FEMA's proposal has been introduced in the House of Representatives as H.R. 3430, the Disaster Relief Act Amendments of 1983.

After nine years of implementing the Disaster Relief Act, we feel that the Act is a sound vehicle for administering appropriate Federal relief, allowing flexibility according to the needs of the given disaster, as well as reasonable limits. We do, however, have several amendments as contained in the HR 3430 which would strengthen and streamline the assistance.

Mr. Chairman, we would encourage and request that you and your fellow Committee members grant favorable consideration to these proposals at such time as they are before you in the House.

This concludes my formal statement and I would now be happy to answer any questions you may have on these matters.

Statement of George L. Darby, Area Director, Disaster Area 3

Mr. Chairman and members of the subcommittee, let me first say that the Small Business Administration appreciates the opportunity to appear before your Subcommittee to represent our Agency, its Disaster Loan Program, and those employees who are actively engaged in bringing assistance to those thousands of disaster victims here in Houston, Galveston and the surrounding area.

As you know, in a Presidentially declared disaster the SBA is one of a team of federal, state and charitable agencies who work together in an effort to help the disaster victims restore their lives and businesses. Our job in any disaster is to provide long-term loans to eligible individual applicants and to business applicants on terms tailored to meet the individual victim's ability to repay the loan. The exact rate of interest charged is based on whether the borrower has the ability to obtain the necessary funds from non-government lenders.

Perhaps it would be helpful to the Committee for me to describe the procedure which we follow in implementing our program. Once the President has made a declaration, the coordinating agency, FEMA, and the Federal Coordinating Officer (FCO) locate facilities for establishing Disaster Assistance Centers or DAC's as we call them. Once the DAC locations have been established, we are notified of the location and hours of operation. We staff these centers with SBA employees and volunteers (which I will comment on later), and these representatives conduct individual interviews with each disaster victim. If, at this initial interview, it is determined that the disaster victim would obviously be unable to repay a loan, that individual's request would be processed immediately and referred to the state's Individual and Family Grant program for assistance. All business applicants and those individuals deemed eligible are given loan applications, instructions on how to complete them, and told to return the application and supporting documents to the SBA for processing.

As applications are returned they are reviewed by a loan officer and if complete are accepted for processing. If they are incomplete, the applicant, will be informed of the deficiency and asked to submit any additional information required. When a complete application is accepted, it is logged in, given a control number, and a credit report is obtained. At this point the file is assigned to a damage verifier who will contact the victim to make arrangements for an on-site inspection of the damages to establish the dollar amount necessary to repair and/or replace the damages. Upon completion of the verification of damages, the file is assigned to a loan officer. The loan officer will review the file, examine the victim's income and expenses, and make recommendations as to approval or decline, interest rate, payment schedules, maturities, loan amounts, uses of proceeds, collateral requirements, insurance requirements, etc. His recommendations are then forwarded to an Assistant Branch Manager for final action. If approved, the loan file is then given to our control section for the preparation of documents as required for any loan. Upon completion of the documents they are mailed to the borrower who will bring them in to one of our local representatives for execution of the notes, loan agreements, and whatever other documents are required by the individual loan. When the documents have all been executed and the loan properly closed, the SBA will then instruct the Treasury to issue a check, at which point we will begin disbursement on the loan. The smaller loans, say $5,000 or less, require only one disbursement. On the larger loans, we make disbursements as dictated by the progress of the reconstruction. Once the loan is fully disbursed and the repairs have been completed, we then transfer that file to our local district offices for servicing.

The one question we are asked most frequently by the applicants is "How long will it take to get this loan?" There is, unfortunately, no quick or precise answer. Our agency has established a nationwide goal of completing all functions up to and including notification of the loan decision within 60 days. Obviously once we mail out the closing documents control of the time elements involved is in the hands of the borrower. I am happy to report to you that here in Area 3 our average processing time, as measured between the date we receive the application and the date the applicant has either been mailed their closing documents or referred to another agency for assistance, has been approximately 30 days. Because of the size, scope and complexity of this disaster, I cannot promise you that we will maintain that 30 day average; however, on behalf of our Agency I can pledge to you that we will put forth every reasonable effort to do so. For the benefit of any victim that may be present, I can tell you that the earlier the application is returned the quicker we are able to process. As proof of that, on Monday, September 12, less than three weeks after we opened the first Disaster Assistance Center, we made disbursement on the first four loans processed in this disaster.

Mr. Chairman, I would like to share with you a few particulars on Hurricane Alicia and our efforts to date. At the peak of activity we had 78 employees in the five DAC centers and the Disaster Field Office. In addition to our own employees, the local banks and savings and loan institutions supplied us with a total of 56 employees over the first two-week period. In response to our call for assistance, they sent loan officers and other employees to our centers in Galveston, Baytown. League City, Ellington Air Force Base, Jacinto City, Freeport, and Conroe. Their people worked over 725 hours in the Disaster Assistance Centers during the peak first two weeks. Their presence in those centers was a visual expression of confidence in their communities' ability to bounce back from a devastating blow. If one wishes to reduce this contribution to a dollar value, let me say that to have detailed even junior grade SBA loan officers in place of these volunteers would have cost the government almost $15,000 for that two-week period.

But that's only part of the story, Mr. Chairman. On the day after the DACs opened we met with the top officials of every lending institution in Galveston. About six days later we held a meeting with the leading financial institutions around the Kemah-League City-Baytown area. In these meetings we explained the workings of our program and asked them to make interim, short-term loans to the businesses of their communities so that they could re-open as quickly as possible and restrict their losses. Despite the fact that we can give no guarantee on such loans, their response has been excellent. These interim loans are being made throughout the disaster area.

Furthermore, local bankers arranged for us to meet with the local businessmen and women on evenings after the DACs were closed so that these businessmen and women could not have to take time out from rebuilding their businesses by spending several hours at one of the Disaster Assistance Centers. We had two of these meetings, one in Galveston and the other in Baytown, where we saw well in excess of 300 business victims.

In my opinion, these unselfish contributions from the private sector are in the best American tradition of neighbor helping neighbor, and on behalf of the Small Business Administration we wish to publicly express our most sincere appreciation.

To date we have interviewed a total of 16,432 victims, 13,844 individuals and 2,588 businesses. As of the close of business last Wednesday, we had received 1,327 applications for individual assistance and 240 applications for business assistance.

We have already verified 718 individual losses and 101 business losses and our average verification time to date has been approximately 4 days. Of those verified, we have already approved 170 loans for $1,464,700. Our average processing time to date is about 11⅓ days.

Our best projection at this time is that by the filing deadline of October 18, 1983, we will have interviewed over 17,000 victims and will have received around 7,000 applications for assistance.

Finally, Mr. Chairman, I would like to express our appreciation to all our fellow agencies and programs. To FEMA; the Temporary Housing Program; to the State of Texas, its Department of Emergency Services, the Individual and Family Grant Program, and the Texas Industrial Commission; to the Federal Flood Insurance Administration; and to the American National Red Cross and other volunteer organizations. The cooperation and assistance they have extended to us has been very helpful and most appreciated. And certainly I wish to thank our employees for the job they have done. To the best of my knowledge, we have not received one single complaint from any disaster victims. We are very proud of that fact.

Mr. Chairman, I will be most happy to answer any questions you or the Subcommittee may have at this time.

STATEMENT OF ROBERT A. LANSFORD, STATE COORDINATOR, GOVERNOR'S DIVISION OF EMERGENCY MANAGEMENT, TEXAS DEPARTMENT OF PUBLIC SAFETY

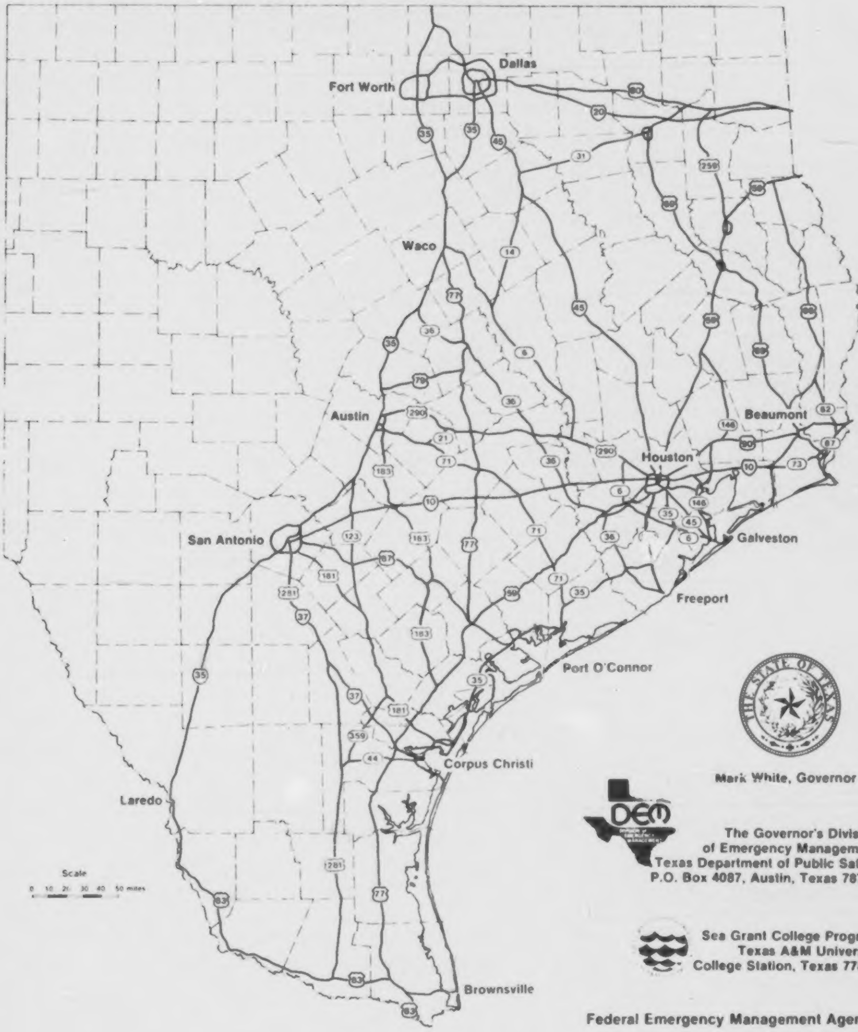
Mr. Chairman, thank you for inviting us here today and for the opportunity of sharing with you those activities that take place during major disasters.

As you know, Hurricane Alicia struck the upper Texas Coast in the early morning hours of August 18, 1983. Prior to that point and after landfall, many preparedness, response and recovery activities have taken place and will continue for some time to come. As of this date, 8 counties requested by the Governor have been declared by FEMA as major disaster areas for public property assistance. We have, as of yesterday, received notice of intent from 112 political entities of filing for the public property assistance program under Public Law 93-288. As of September 22, 1983, 10 project applications have been approved and advances totaling $4,632,365.00 have been granted by FEMA and the state to assist in a speedy recovery effort. Additional project applications are being prepared at this time.

On behalf of the state emergency management office, I would like to thank those federal agencies; FEMA, SBA, NWS, COE and others, for the assistance they have given us. We appreciate not only the cooperation in the recovery efforts, but also the mitigation, preparedness and response activities as well.

I would be happy to try and answer any questions you may have.

Keys to Hurricane Safety



Mark White, Governor

The Governor's Division
of Emergency Management
Texas Department of Public Safety
P.O. Box 4087, Austin, Texas 78773

Sea Grant College Program
Texas A&M University
College Station, Texas 77843

Federal Emergency Management Agency

This information is provided as a public service. Its purpose is to increase hurricane awareness. *The key to safety is advance preparation.*

BEFORE A HURRICANE THREATENS..

Know Elevation of Your Home Above Sea Level

This information is available from local Emergency Management officials. Your nearest Weather Service office can supply flood-stage data for area streams and bayous.

Learn Potential Maximum Storm Surge

Find out if your home is subject to storm surge (tidal) flooding. Information about the potential for inland flooding and storm surge is available through the nearest Weather Service office.

How Safe Is Your Home?

Plan to relocate during a hurricane emergency if you live near the seashore. If you live in a mobile home, always plan to relocate.

Know Location of Nearest Shelter

Emergency Management or Red Cross personnel can give you the location of the shelter nearest your home and explain what you should bring with you.

Plan for your family's safety. Know how to contact family members should the need arise.

Plan Route to Safety If You Must Leave

Plan your escape route early. Check with Emergency Management personnel for low points and flooding history of your route. Check the number of hours it could take you to evacuate to a safe area during peak evacuation traffic.

Inventory Your Property

A complete inventory of personal property will help in obtaining insurance settlements and/or tax deductions for losses. Inventory checklists can be obtained from many sources, including your insurance representative. Do not trust your memory. List descriptions and take pictures. Store these and other important insurance papers in waterproof containers or in your safety deposit box.

Check Insurance Coverage

Review your insurance policies and your coverage to avoid misunderstandings later. Take advantage of flood insurance. Separate policies are needed for protection against wind and flood damage, which people frequently do not realize until too late. *Do not wait until a hurricane is in the Gulf*--by then, it is too late. When a storm is heading to shore, insurance offices are too busy preparing for the emergency and won't be able to respond to individual requests, and insurance cannot be obtained.

WHEN A WATCH IS ISSUED.....

Make Plans Early

Listen Constantly to Radio or TV

Monitor storm reports and keep a log of hurricane position. Remember--evacuation routes sometimes can be closed up to 20 hours before landfall by wind gusting or storm surge flooding.

If considering moving to a shelter, make arrangements for all pets. Pets are not allowed in shelters.

Refill needed prescriptions.

If evacuation has not already been recommended, consider leaving the area early to avoid long hours on limited evacuation routes.

Check Supplies

- **Transistor Radio with Fresh Batteries**

  A radio will be your most useful source of information. Have enough batteries to last several days. There may be no electricity.

- **Flashlights, Candles or Lamps, and Matches**

  Store matches in a waterproof container. Have enough lantern fuel for several days, and know how to use it safely.

- **Full Tank of Gasoline**

  Never let your vehicle gas tank be less than half-full during hurricane season. Fill the tank as soon as a hurricane watch is posted. **Remember**--when there is no electricity, gas pumps won't work.

- **Canned Goods and Non-perishable Foods**

  Store packaged foods which can be prepared without cooking and need no refrigeration. There may be no electricity or gas.

- **Containers for Drinking Water**

  Have clean, air-tight containers to store sufficient drinking water for several days. The city supply will probably be interrupted or contaminated.

- **Materials to Protect Glass Openings**

  Have shutters or lumber to protect large windows and doors and masking tape for use on small windows.

- **Materials for Emergency Repairs**

  Your insurance policy may cover the cost of materials used in temporary repairs so keep all receipts. These also will be helpful for any income tax deductions.

WHEN A WARNING IS ISSUED.....

Continue Listening to Radio or TV

Continue to monitor hurricane position, intensity and expected landfall.

If You Live in a Mobile Home

Check tie-downs and leave immediately for a safer place. Mobile homes are not safe in hurricane force winds.

Prepare for High Winds

Brace your garage door. Lower antennas. Be prepared to make repairs.

Anchor Outside Objects

Garbage cans, awnings, loose garden tools, toys and other loose objects can become deadly missiles. Anchor them securely or move them indoors.

Protect Windows and Other Glass

Board up or shutter large windows securely. Tape exposed glass to reduce shattering. Draw drapes across windows and doors to protect against flying glass if shattering does occur.

Move Boats on Trailers Close to House

Fill boats with water to weight them down. Lash securely to trailer and use tie-downs to anchor the trailer to the ground or house.

Check Mooring Lines of Boats in Water .... THEN LEAVE THEM

Store Valuables and Personal Papers

Put irreplaceable documents in waterproof containers and store in the highest possible spot. If you evacuate, be sure to take them with you.

Prepare for Storm Surge, Tornadoes and Floods

Storm surge, tornadoes and flash floods are the worst killers associated with a hurricane. During a tornado warning, seek shelter inside, below ground level if possible, or in an interior hallway, closet or bathroom on ground level. If outside, move away at right angles from the tornado; if escape is impossible, lie flat in a ditch or low spot. The surge of ocean water plus flash flooding of streams and rivers due to torrential rains combine to make drowning the greatest cause of hurricane deaths.

Check Your Survival Supplies Again

IF YOU STAY AT HOME.....

Stay Indoors....

....*In an inside room away from doors and windows.* Don't go outside in the brief calm during passage of the eye of the storm. The lull sometimes ends suddenly as winds return from the opposite direction. Winds can increase in seconds to 75 mph or more.

Protect Property

Without taking any unnecessary risks, protect your property from damage. Temporary repairs can reduce your losses.

Stay Away from Windows, Glass Doors

Move furniture away from exposed doors and windows.

Stay Tuned to Media Broadcasts
Keep a radio or television tuned for information from official sources. Unexpected changes can sometimes call for last minute relocations.

Remain Calm
Your ability to meet emergencies will help others.

IF YOU MUST EVACUATE....

Know Where You Are Going... leave early in daylight if possible.

Move Your Most Valuable Possessions that you can't take with you to higher points within your home.

For Shelters
Take blankets or sleeping bags, flashlights, special dietary foods, infant needs and lightweight folding chairs.

Register every person arriving with you at the shelter.

Do not take pets, alcoholic beverages or weapons of any kind to shelters.

Be prepared to offer assistance to shelter workers if necessary, and stress to all family members their obligations to keep the shelter clean and sanitary.

Don't Travel Farther than Necessary
Roads may be jammed. Don't let your stranded auto become your coffin.

Lock Windows and Doors
Turn off gas, water and electricity in your home. Check to see that you have done everything possible to protect your property from damage and loss.

Take Survival Supplies With You

- First-aid kit
- Canned or dried provisions, can opener, spoons, etc.
- Bottled water
- Extra family medications, prescriptions
- Spare eyeglasses, hearing aids and batteries, if needed.

Keep Important Papers with You at all Times

- Driver's license and other identification
- Insurance policies
- Property inventory
- Medic-alert or device to convey special medical information
- Maps to your destination

Take Warm, Protective Clothing

AFTER THE HURRICANE....

If You Are Evacuated, delay your return until it is recommended or authorized by local authorities.

Beware of Outdoor Hazards
Watch out for loose or dangling power lines, and report them immediately to proper authorities. Many lives are lost through electrocution.

Walk or Drive Cautiously
Debris-filled streets are dangerous. Snakes and poisonous insects will be a hazard. Washouts may weaken road and bridge structures which could collapse under vehicle weight.

Guard Against Spoiled Food
Food may spoil if refrigerator power is off more than a few hours. Freezers will keep food several days if doors are not opened after power failure, but do not refreeze food once it begins to thaw.

Do Not Use Water Until Safe
Use your emergency supply or boil water before drinking until official word that the water is safe. Report broken sewer or water mains to the proper authorities.

Take Extra Precautions to Prevent Fire
Lowered water pressure in city mains and the interruption of other services may make fire fighting extremely difficult after a hurricane.

THE RECOVERY....

Insurance
Insurance representatives will be on the scene immediately following a major disaster to speed up the handling of claims. Notify your insurance agent or broker of any losses--and leave word where you can be contacted.

Take Steps to Protect Property
Make temporary repairs to protect property from further damage or looting. Use only reputable contractors (sometimes in the chaotic days following a disaster, unscrupulous operators will prey on the unsuspecting). If possible, check contractors through the Better Business Bureau. Keep receipts for materials used.

Be Patient
Hardship cases will be settled first by insurance representatives. Don't assume your settlement will be the same as your neighbor's. Policy forms differ and storm damage is often erratic. In a major catastrophe, the insurance industry will have emergency offices and extra manpower to expedite claim settlements and to speed recovery. Everyone cannot be first.

It Takes a Team Effort
Responsibility for the clean-up falls to numerous local, state and federal agencies. A local Emergency Management coordinator (the mayor, county judge or a designated representative) will be on hand to help residents in this effort.

Hurricane-Related Terms

Eye--The relative calm area in the center of a storm. Winds are light in this area and the sky often is only partly covered by clouds.

Gale warning--A warning of sustained winds within the range of 39 to 54 miles per hour.

Hurricane--A tropical cyclone with sustained winds of 74 mph or greater.

Hurricane advisories--Messages issued by the National Hurricane Center in Miami which summarize all coastal warnings that are in effect, including hurricane watches. In addition to a description of the storm, its position, anticipated movement and prospective threat are given.

Hurricane watch--The first alert when a hurricane poses a possible, but as yet uncertain, threat to a certain coastal area. Small craft advisories are issued as part of a hurricane watch advisory.

Hurricane warning--Notice that within 24 hours or less a specified coastal area may be subject to (a) sustained winds of 74 mph or higher and/or (b) dangerously high water or a combination of dangerously high water and exceptionally high waves, even though expected winds may be less than hurricane force.

Landfall--The position at a seacoast where the center of a hurricane passes from sea to land.

Local statement--A public release prepared by a Weather Service Office in or near a threatened area giving specific details to protect life and property in the office's area of responsibility.

Small craft warnings--When a hurricane or tropical storm threatens a coastal area, small craft are advised to remain in port or not to venture into the open sea.

Storm surge--An abnormal rise in the level of the sea produced by a hurricane or tropical storm. This inundation is usually responsible for the greatest loss of life and destruction of property.

Storm warning--When associated with a hurricane or tropical storm, a warning of sustained winds in the range of 55 to 73 mph, inclusive.

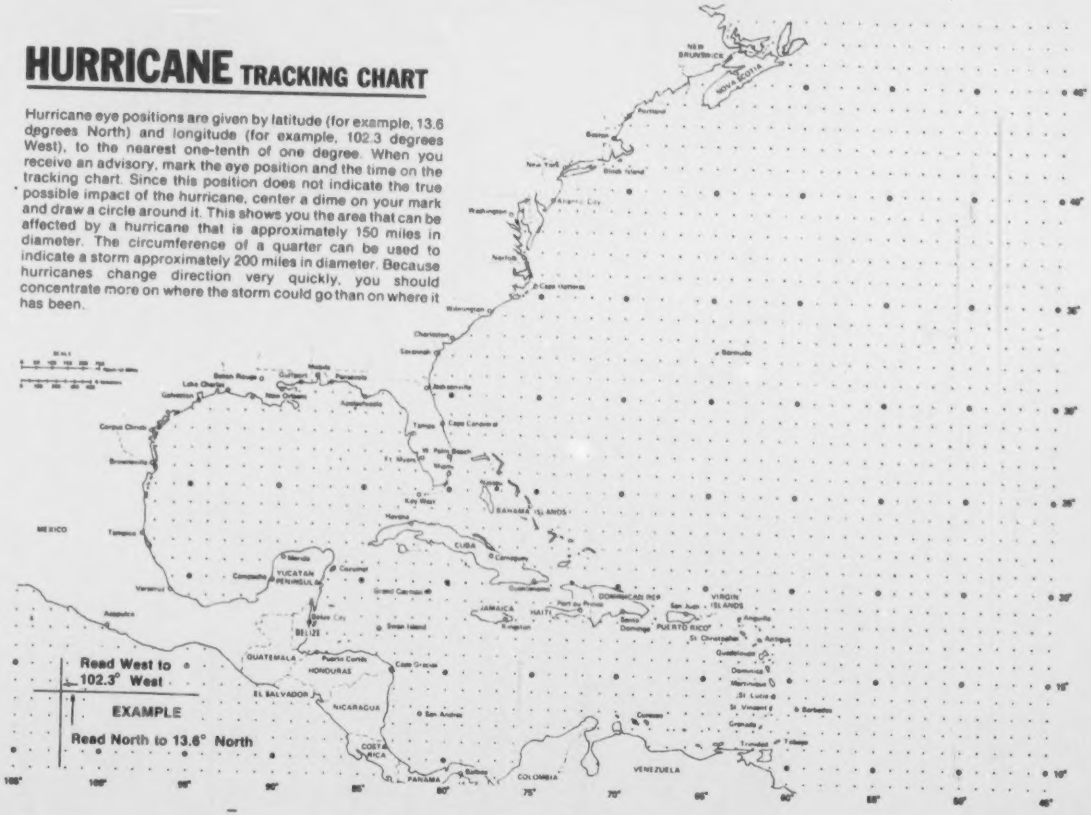
Tropical disturbance--A moving area of thunderstorms of tropical origin that maintains its identity for 24 hours or more.

Tropical depression--A rotary circulation at the surface of the water with sustained wind speed of 38 mph or less.

Tropical storm--Distinct rotary circulation with sustained wind speeds of 39 to 73 miles per hour.

HURRICANE TRACKING CHART

Hurricane eye positions are given by latitude (for example, 13.6 degrees North) and longitude (for example, 102.3 degrees West), to the nearest one-tenth of one degree. When you receive an advisory, mark the eye position and the time on the tracking chart. Since this position does not indicate the true possible impact of the hurricane, center a dime on your mark and draw a circle around it. This shows you the area that can be affected by a hurricane that is approximately 150 miles in diameter. The circumference of a quarter can be used to indicate a storm approximately 200 miles in diameter. Because hurricanes change direction very quickly, you should concentrate more on where the storm could go than on where it has been.



TAMU-SG-83-503
815M April 1983
NA79AA-D-00127
R/DS-5

Evacuation and Contingency Zones
Galveston Bay Area

Counties: Brazoria Galveston Harris Fort Bend Chambers

The enclosed map and the accompanying chart show the zones susceptible to storm surge flooding in the Galveston Bay area and the time required for partial or complete evacuation of people for each area. These evacuation guidelines are the result of information obtained using the National Weather Service's storm surge computer model called SLOSH (Sea, Lake, Overland Surge from Hurricanes) and a computer model developed by the Texas Transportation Institute of The Texas A&M University System. The resulting **Hurricane Relocation Planning for Brazoria, Galveston, Harris, Fort Bend and Chambers Counties** is a unique program that presents a carefully developed method of forecasting when evacuation routes may become unsafe or impassable because of high winds or storm surge flooding, and the length of time required for residents and vehicles in each evacuation zone and each contingency zone to safely clear the hazardous areas.

Evacuation and contingency zones represented on this map indicate areas where storm surge could penetrate for differing hurricane intensities. **Evacuation zones** are those areas that could be affected by storm surge flooding generated by winds up to 130 mph. These zones are represented by the solid shading and indicated by letters (G for Galveston County, H for Harris County, etc.) with subscript **numbers** for areas within the county. **Contingency zones** are those areas that could be affected by storm surge flooding generated by winds greater than 130 mph. These areas are represented by a dot pattern and indicated by letters (G for Galveston County, H for Harris County, etc.) with a subscript **letter** for area identification.

This is a very thorough forecasting program. It must be understood, however, that this program cannot take into consideration the effect that isolated rain and local drainage may have on your ability to evacuate from your area.

If you are surprised or suspect that the time recommended for partial or total evacuation of your area is too conservative, just remember that very few new major highways have been added to the Galveston Bay area during the past 25 years, while the number of people and automobiles in this area has increased tremendously. To make matters worse, most of the areas along the bay shore have suffered significant land subsidence, causing evacuation routes to flood more easily as a result of rainwater runoff as well as by storm surge.

Use this map to determine your zone. Using the chart, check the number of hours that it could take you to evacuate your family to a safe area during peak traffic. Remember that the estimated number of hours listed means that evacuation from your zone would need to be completed before evacuation routes are closed. Also remember—**evacuation routes can be cut off by wind or storm surge many hours before the hurricane makes landfall.**

If you prefer to leave early, do so during the **hurricane watch** period. Otherwise, wait until your local governing authority recommends evacuation of your area and **then leave promptly.** Persons in non-incorporated areas receive evacuation recommendations from their county governments, while those living within incorporated areas are advised by their municipal governments.

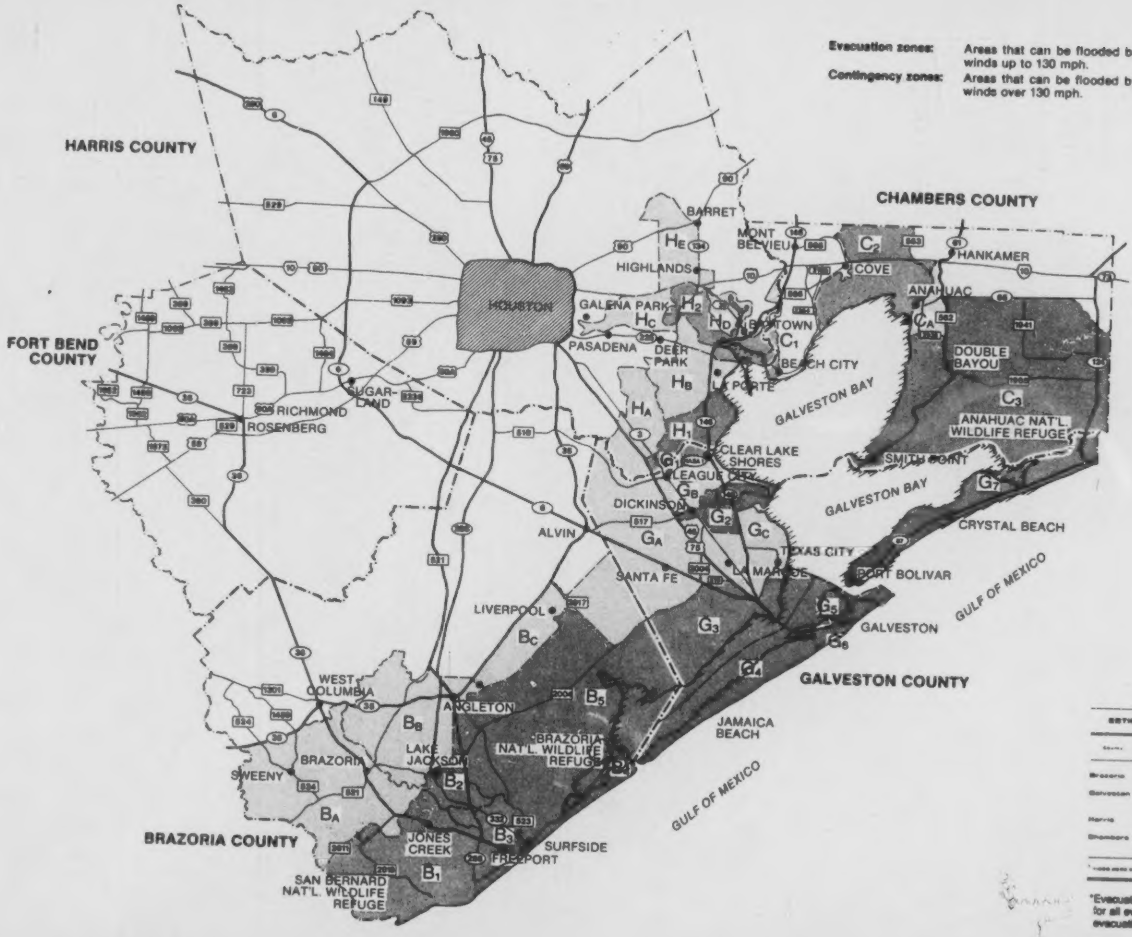
If you are traveling toward Houston, listen to your radio for information on the best routes to area shelters and through Houston. The primary **Emergency Broadcasting Station** in the Houston area is **KTRH (740 AM); KPRC (950 AM)** is the backup station.

NOAA Weather Radio is a service of the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce. It provides continuous 24-hour per day broadcasts of the latest weather information directly from National Weather Service offices. Taped weather messages are repeated every four to six minutes and are revised regularly. During severe weather, forecasters can interrupt the routine broadcasts and substitute special warning messages. **NOAA Weather Radio** broadcasts are made on one of three high-band **FM frequencies--162.55 (Galveston), 162.40 (Houston) or 162.475 (Beaumont) megahertz (MHZ).**

TAMU-SG-83-503/G

Evacuation zones: Areas that can be flooded by storm surge from hurricanes with sustained winds up to 130 mph.

Contingency zones: Areas that can be flooded by storm surge from hurricanes with sustained winds over 130 mph.



▨ Evacuation Zone

☐ Contingency Zone

— Evacuation Routes

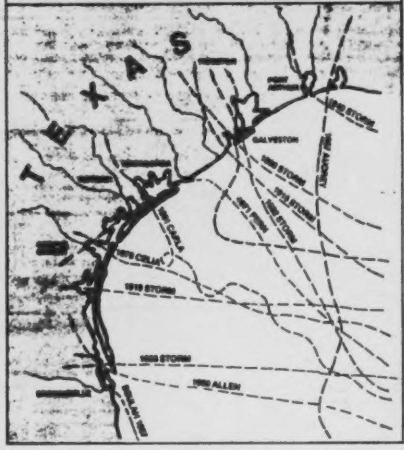
ESTIMATED EVACUATION TIMES BY COUNTY AND ZONE

County	[illegible]	[illegible]
Brazoria	14 Hours (B1, B2, B3, B4, B5)	20 Hours (B1, B2, B3, B4, B5, BA, BB, BC)
Galveston	14 Hours (G1, G2, G3, G4, G5, G6) 5 Hours (G7)	26 Hours (G1, G2, G3, G4, G5, G6, GA, GB, GC) 4 Hours (G7)
Harris	14 Hours (H1) 2 Hours (H2)	26 Hours (H1, HA) 4 Hours (H2, HB, HC, HD, HE)
Chambers	3 Hours (C2, C3) 2 Hours (C1)	4 Hours (C2, C3, CA) 3 Hours (C1)

[illegible]

*Evacuation time is the estimated number of hours it would take for all evacuating vehicles to reach safe areas using available evacuation routes.

TRACKS OF SOME MAJOR OR EXTREME HURRICANES THAT HAVE STRUCK THE TEXAS COAST THIS CENTURY



HURRICANE HISTORY

Date Storm Made Landfall	Deaths	Wind MPH	Tides (Ft.)
1900-Sept. 8	6,000 +	135 +	15-20
1915-Aug. 17	275	135 +	15-20
1919-Aug. 14	287	Severe In Both Florida and Texas	
1932-Aug. 13	40	100 + 135	10-15
1933-Aug. 4	40	80 +	
1949-Oct. 3	2	135 +	10-15
1957-June 27 Audrey	381	100	12 +
1961-Sept. 11 Carla	46	135 +	15-22
1967-Sept. 20 Beulah	15	109 +	Record number of Tornadoes; Major Floods
1970-Aug. 3 Celia	11	130-170	
1980-Aug. 9 Allen	2	90-100	8-12

Hurricane Facts for the Texas Coast

The pattern of hurricanes reflects a major hurricane about every ten years. Hurricanes hit the Texas coast on an average of one every 2 1/2 years, bringing the killing and destructive storm surge, rain, wind and tornadoes.

The Texas coast continues to grow in population, and with the increased population, there is increased building right down to the water line. In addition, in some areas where this increased growth is occurring, the land has sunk as much as ten feet, making many more areas subject to tidal flooding.

Newcomers to the coast are unfamiliar with the effects of tropical storms and do not know of the necessity of planning and steps to take to protect life and property. As much as a third of the coastal population has never experienced a hurricane.

Each hurricane has its own characteristics-- and is accompanied by features which provide distinctly different types of damage. For example, three hurricanes which hit Texas -- Carla (1961), Beulah (1967) and Celia (1970) -- each had different characteristics and damage effect.

Carla, one of the largest hurricanes in the Gulf of Mexico, had a 22-foot storm surge, and winds up to 160 mph. Tidal flooding occurred on most all of the Texas coast, providing the most storm damage.

Beulah was characterized by heavy rainfall (30-plus inches), providing widespread freshwater flooding, and had over 100 tornadoes, spreading into the center of the state.

Celia, different from both Carla and Beulah, was a small (70 miles across), very strong hurricane which strengthened rapidly as it was approaching land, with gusts to 162 mph before the recorder broke.

So...hurricanes can have high storm surge, widespread saltwater and freshwater flooding, strong and violent winds, tornadoes, and will usually have a combination of them all.

Storm Surge

Nine of ten deaths which occur in a hurricane are from the storm surge. The storm surge also causes most of the loss of property in hurricanes. The storm surge is in addition to the regular tide, and is caused by the "lifting up" of the ocean under the storm. The maximum surge is usually to the right of the track of the hurricane, near the point of maximum winds. This makes the greatest danger from both winds and surge to the right of the storm track.

The 22-foot surge in Carla in 1961 at Matagorda Bay is well remembered by Texans, but in 1969, Hurricane Camille caused at 25-foot surge in Mississippi, the highest on record in the Western Hemisphere. Protection against such surges is difficult. Sea walls and strongly constructed buildings offer some protection, but are not indestructible. The only sure way to avoid damage from a storm surge is not to build in low-lying coastal areas. Since most of the Texas coast is below 20 feet MSL, much of the coastal area is susceptible to storm surge damage.

Tornadoes

Associated with the other destructive elements of a hurricane, tornadoes are a threat both at the coast and inland, and always pose a threat in the hurricane area. Hurricane Beulah, with 115 tornadoes (sixty-seven in one day), set a national record.

Effect on Shoreline

When a hurricane hits a coastline, erosion at the beach sometimes moves the shoreline several hundred feet. When a hurricane crosses offshore barrier islands, the powerful currents cut channels completely through the island. Hurricane Allen cut through South Padre Island in 69 places. To place a structure over one of these channels is deliberately courting disaster. *Building near the shore in an area susceptible to erosion is asking for trouble.*

The Texas coast has been mapped showing erosion zones and washover channels. This information is public, but most existing home and condominium owners are not aware of these natural hazards.

Freshwater Flooding

Hurricanes sometime produce large amounts of rainfall, and the resultant flooding causes widespread damage well away from the coastline, as in Beulah. Even tropical storms, such as Claudette in 1979, which set a new national 24-hour rainfall of 43 inches near Alvin, can cause widespread property damage from low-level flooding. Property owners should ascertain susceptible levels for flooding and make plans to build at levels to minimize flood damage.

Increasing Danger

The increase of coastal population and the larger area of flooding potential combines to increase the chance of a major disaster. To prepare for such a disaster on the Texas coast, planning and action is needed by all involved entities, including the development of evacuation plans and a continuous awareness program to educate the public on actions before, during, and after a hurricane threat or occurrance. These hurricane facts are to remind the long-time resident and inform the newcomer of hurricane hazards. They are not intended to alarm but to inform. Sooner or later we will experience another major or extreme hurricane. Ignorance or apathy to these facts can be our worst enemy.

DEFINICIONES DE AVISOS DE HURACÁN Y SEÑALES DE LA OFFICINA DE METEOROLOGÍA DE LOS ESTADOS UNIDOS DE AMERICA.

Huracán: Un ciclón tropical, acompañdo por vientos de 75 millas por hora or más, ocurriendo sobre el océano Atlántico, el mar de Caribe, el Golfo de Mexico, o el este y norte central del océano del Pacifico. Cuando en completo desarrollo, huracanes son las más destructivas de todas las tormentas. En el Hemisferio del Norte los vientos del huracán dan vuelta al contrario que un reloj y vientos hasta de 150 millas por hora han ocurrido en el área de la banda circular, comenzando en la orilla del centro del huracán y extendiendo para afuera de 20 a 30 millas o más. El movimiento del huracán para el frente puede ser muy despacio, o puede permanecer fijo por un corto tiempo, especialmente cuando el huracán está en el trópico. A como camine el huracán a latitudes más altas, su velocidad generalmente aumenta y puede, en casos de extremo, alcanzar 50 millas o más.

Vigilia Para Huracán: Un anuncio dado por la oficina de meteorología de los Estados Unidos de America para el público y otros intereses de la prensa y difusión de la radio y televisión cuando una tormenta tropical o huracán llega a ser una amenaza para alguna área de la costa. El anuncio de "Vigilia para Huracán" no es una advertencia; el anuncio indica que el huracán está suficiente cerca para que todos en el área que cubre la "Vigilia" deben de escuchar noticias subsiguientes y que estén listos para tomar precauciones en caso de que aviso de huracán seá dado.

Aviso De Huracán: Un anuncio indicando que vientos de huracán de 74 millas por hora o más, o una combinación de altas olas de agua peligrosas y mar borrascoco (con vientos tan bajos como de 60 millas por hora) se esperan en una área especifica de la costa. Cuando el "Aviso de Huracán" es dado, las condiciones del huracán se consideran inminentes y pueden empezar inmediatamente o a lo menos dentro de 24 horas. Es de suma importancia que precauciones seán tomadas inmediatamente cuando "Aviso de Huracán" es dado.

NOAA RADIO DE TIEMPO

162.40 MHz – Houston, Victoria, Pharr
162.475 MHz – Beaumont
162.55 MHz – Galveston, Corpus Christi, Brownsville

ESTACIÓN DE RADIO COSTERO

( ) Frecuencia
•Primario Conocido Estación De Emergencia

Alvin
KACC-FM (91.3)
KTEK-AM (1110)

Bay City
KIOX-AM (1270)

Baytown
KBUK-AM (1360)

Beaumont
KAYC-AM (1450)
KAYD-FM (97.5)
KTLK-AM (1380)
KWIC-FM (107.7)
•KLVI-AM (560)
KQXY-FM (94.1)
KALO-AM (990)
KALO-FM (95.1)
KVLU-FM (91.3)

Brownsville
KBOR-AM (1600)
KDUV-FM (100.3)
KRIX-FM (99.5)

Corpus Christi
KCCT-AM (1150)
KCTA-AM (1030)
KOUL-FM (103.3)
•KEYS-AM (1440)
KZFM-FM (95.5)
KIKN-AM (1590)
KIOU-FM (96.5)
KRYS-AM (1360)
KSIX-AM (1230)
KEXX-FM (93.9)
KUNO-AM (1400)

Falfurrias
KPSO-AM (1260)

Freeport
KBRZ-AM (1460)

Galveston
KGBC-AM (1540)
KILE-AM (1400)

Harlingen
•KGBT-AM (1530)
KELT-FM (94.5)
KIWW-FM (96.1)

Houston
KCOH-AM (1430)
KRBE-AM (1070)
KEYH-AM (850)
KFMK-FM (97.9)
KGOL-FM (107.3)
KHCB-FM (105.7)
KIKK-AM (650)
KIKK-FM (95.7)
KILT-AM (610)
KILT-FM (100.3)
KLAT-AM (1010)
KLEF-FM (94.5)
KLVL-AM (1480)
KMCV-FM (106.9)
KMJQ-FM (102.1)
KNUZ-AM (1230)
KQUE-FM (102.9)
KODA-FM (99.1)
KPFT-FM (90.1)
KPRC-AM (950)
KRBE-FM (104.1)
KRLY-FM (93.7)
KSRR-FM (96.5)
•KTRH-AM (740)
KLOL-FM (101.1)
KTRU-FM (91.7)
KTSU-FM (90.9)
KUHF-FM (88.7)
KKBQ-AM (790)
KKBQ-FM (92.5)
KXYZ-AM (1320)
KYOK-AM (1590)

Kingsville
KINE-AM (1330)
KPUP-FM (97.7)
KTAI-FM (91.1)

McAllen
KIRT-AM (1580)
KQXX-FM (98.5)
KRIO-AM (910)
KVMV-FM (96.9)

Orange
KOIC-FM (106.1)
KOGT-AM (1600)
KZOM-FM (104.5)

Port Arthur
KOLE-AM (1340)
KPAC-AM (1250)
KHYS-FM (98.5)
KYKR-FM (93.3)

Port Lavaca
KGUL-AM (1560)
KGUL-FM (95.9)

Port Neches
KDLF-AM (1150)

Raymondville
KSOX-AM (1240)

Refugio
KYOT-FM (106.3)

Robstown
KROB-AM (1510)
KROB-FM (99.9)

Victoria
•KNAL-AM (1410)
KTXN-FM (98.7)
KVIC-AM (1340)
KCWM-FM (95.1)

Weslaco
KRGV-AM (1290)

Wharton
KANI-AM (1500)

ESTACIÓN DE TELEVISIÓN COSTERO

Beaumont
KBMT-TV Ch. 12
KFDM-TV Ch. 6
KJAC-TV Ch. 4

Corpus Christi
KEDT-TV Ch. 16
KIII-TV Ch. 3
KORO-TV Ch. 28
KRIS-TV Ch. 6
KZTV-TV Ch. 10

Harlingen
KGBT-TV Ch. 4

Houston
KHOU-TV Ch. 11
KHTV-TV Ch. 39
KPRC-TV Ch. 2
KRIV-TV Ch. 26
KTRK-TV Ch. 13
KUHT-TV Ch. 8

McAllen
KVEO-TV Ch. 23

Victoria
KXIX-TV Ch. 19

Weslaco
KRGV-TV Ch. 5

HURACAN PRECAUCIONES

SEÑALES DE AVISO

AIRONASOS: Dos banderas rojas mostradas durante el día o una luz blanca sobre una luz roja durante la noche indican que vientos de 39 a 54 millas por hora se prédica para la área.

VIENTOS TEMPESTUOSOS: Una bandera en cuadro rojo con centro negro mostrada durante el día, o dos luces rojas durante la noche indican que vientos de 55 a 73 millas por hora se prédica para el área.

AVISO DE HURACÁN: Dos banderas en cuadros rojos con centros negros mostradas durante el día o una luz blanca en medio de dos luces rojas durante la noche indican que vientos de 74 millas por hora o más, se prédica para el área.

GOVERNOR'S DIVISION OF EMERGENCY MANAGEMENT
Texas Department of Public Safety

HURACÁN

PRECAUCIONES

PARA LOS QUE NO ESTÁN FAMILIARIZADOS CON HURACANES, LAS SIGUENTES PRECAUCIONES PUEDEN SER LA DIFERENCIA ENTRE LA VIDA O LA MUERTE.

1. Tener su radio o televisión prendido y poner cuidado a las ultimas noticias del prognóstico del tiempo, tocante alertas, y adversiones. Si se corta la electricidad, use su radio de baterías o de su carro asegurandos tambien de no descargar la batería del auto.

2. No le ponga atención a rumores, siga los consejos de su gobierno local tocante a evacuar el lugar si se le dice hagalo. Si se le recomiendan ciertos rutas para viajar, uselos.

3. Retirese de playas o otros lugares que puedan ser cubiertas por altas o tempestuosas olas. Si el pasáje para alto terreno es sobre camino que puede quedar bajo de agua, retirese temprano. No tome el riesgo de ser aislado.

4. Esté alerto de crecientes en lugares donde arroyos o ríos se hunden con demasiada lluvia.

5. Cuando sea evacuado notifique a alguien de su destino y ruta. Si le es posible lleve bastante dinero en efectivo o cheques de viajar y tarjetas de credito para que se sostenga durante varios días. Llevese ropa extra, cosas nesesarias para su bebé, medicinas recetados y comida de dieta especial para varios días.

6. Los animales no son permitidos en resguardos publicos. Consigales lugar seguro y dejeles comida y agua. Guarde sus cosas de valor y papeles importantes en frascos que cierre bien.

7. Si su casa esta fuera de peligro y está bien construida, entonces será el mejor lugar para quedarse durante la tormenta.

8. Procure tener suficiente comida, especialmente comida en bote que require poca preparación. Recuerde que puede estár sin electricidad por un largo tiempo y no funcione su refrigeradora. Si la emergencia requiere cocinar, procure que las facilidades estén en condiciones de usarse.

9. Esté seguro de tener gasolina en su carro. Si la electricidad se termina, gasolineras no podran operar sus pompas por varios días.

10. Revise todos los objetos que el viento pueda volar y ser destructivos. Encierre dentro de su casa los muebles de patio o portal, herramientas para jardín y latas para la basura, o amárrelos bien si se quedan afuera.

11. Proteja sus ventanas cubriéndolas con madera, o use cerraduras para tormenta. Al usar madera, procure que sea buena madera y que esté bien asegurada. Protección mal construida puede causar mas daño que el no tener ninguna. Use fuertes vigas para las puertas de afuera.

12. Esterilize el baño, jarros, botellas, ollas de cocina y llénelas de agua para beber. Quizá el servicio del agua pueda ser suspendido.

13. Tenga lámparas o otros aparatos de luz-de-emergencia en buenas condiciones y a la mano. No use lumbre al descubierto para aluzarse ni velas.

14. Si el centro de la tormenta pasa directamente sobre donde se encuentre habrá un silencio de unos cuantos minutos ha media hora, o mas. Permanezca en un lugar seguro. Haga reparaciones necesarias durante éste tiempo y recuerde que el viento regresara con dirección opuesta, y muy frecuente con más violencia.

15. Permanezca sereno. Su habilidad en confrontar las emergencias inspirara y ayudara o otros.

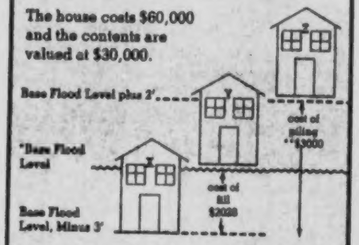
THE GOVERNOR'S DIVISION OF EMERGENCY MANAGEMENT
Texas Department of Public Safety
P. O. Box 4087
Austin, Texas 78773

DEM-2 (7/83)

CONSTRUCTION AND INSURANCE COSTS BASED ON BUILDING ELEVATIONS IN RELATION TO 100-YEAR FLOOD LEVEL

Economics of Elevation for a 1500 Square Foot, One-Story, No Basement House in Zone A 15 which appears on a community's Flood Insurance Rate Map (FIRM).

The house costs $60,000 and the contents are valued at $30,000.



- * The "100-year flood". The flood having a one percent change of occurrence in any given year.
- ** Add $136 per foot of elevation.

ANNUAL COSTS	X	Y	Z
1. Annual Flood Insurance Premium	$881	$192	$ 72
2. Annual Cost of Elevation 30 years at 14%		$288	$426
Total	$881	$480	$498
INSURANCE DAMAGES	$24300	$7200	$2880

NOTE: Costs are based on 1981 cost of construction figures. Insurance costs based on October 1981 figures.

which provide standards for the location and design of new development within flood-prone areas. Proper planning will also consider zoning, building codes, subdivision development, and special purpose floodplain ordinances.

These procedures and regulations will save lives and reduce property loss. When a community makes proper use of its floodplains, the amount of potential damage from future flooding will be reduced while the overall value of the community (tax base) will be enhanced.

To obtain assistance for your community to qualify for the National Flood Insurance Program, contact the Texas Department of Water Resources by writing to P.O. Box 13087, Austin, Texas 78711, or by calling (512) 475-2171. As the State Coordinating agency for the program, Staff of the Department will provide technical assistance in program application or flood plain management.

J-3

BULK MAIL
U.S. POSTAGE
PAID
Austin, Texas
Permit No. 1265

Division of Emergency Management
Texas Department of Public Safety
Box 4087
Austin, Texas 78733

Why Flood Insurance?

WHY FLOOD INSURANCE?

Flooding is the most costly natural calamity in Texas. Ninety percent of the natural disasters that hit Texas are flood-related. The transformation of a dry creek bed or tranquil river into a raging, destructive flood occurs many times a year.

No area of the State of Texas is completely free from the threat of floods. Not only are floods devastating in the loss of lives and property, they are also great wasters of water — and water is a priceless Texas resource. The following statistics show the extent of flood-related property damage and deaths in Texas for the period 1971 through 1980:

Year	Property Damage	Deaths
1971	$ 30,231,000	2
1972	$ 17,800,000	17
1973	$ 60,000,000	10
1974	$ 1,000,000	13
1975	$ 10,500,000	7
1976	$ 26,000,000	3
1977	$ 1,000,000	8
1978	$ 50,000,000	37
1979	$ 250,000,000	20
1980	$ 748,145,000	9
1981	$ 460,000,000	41
Total	$1,183,376,000	1[illegible]3
Average	$118.4 million	12

Source:
Texas Almanac 1980-81
[illegible] Data, National Weather Service

What makes a flood a disaster is what it does to people. Generally, this is because of man's insistence on occupying the floodplain, which is land that may be submerged by an overflowing river or stream.

The economic and aesthetic attractiveness of the normally dry floodplain has encouraged development of flood-prone areas despite their potential for a most disastrous situation. As these lands have been developed, the public demand for protection from econmic losses, CAUSED BY THE INEVITABLE FLOODS, has grown.

For many years, the Federal response to flood disasters was generally limited to building flood control works (dams, levees, seawalls, etc.) and providing disaster relief to flood victims. To compound the problem, flood insurance was generally not available from insurance companies because of the high risk potential. Besides that, construction techniques to reduce flood damage to new or remodeled buildings were often ignored or overlooked. In the face of ever increasing flood losses, Congress established the National Flood Insurance Program by enacting the National Flood Insurance Act of 1968. This is a Federal program administered by the Federal Insurance Administration (FIA) within the Federal Emergency Management Agency (FEMA). The program enables property owners in participating communities to buy flood insurance at reasonable rates. To participate, a community must make an effort to reduce flood losses through more comprehensive floodplain management and require new buildings to be elevated or floodproofed up to or above the 100-year flood level.

The following examples shows three items concerning similar houses built at three different elevations relative to the "100-year" flood level:

1. Cost of flood insurance.
2. Cost of elevating the house.
3. Estimated damages when the flood arrives.

From the illustration it is easy to determine the comparative expense of building with the ground floor on, above or below the base flood elevation ("100-year" flood level).

This clearly demonstrates what "floodplain management" can mean in the operation of an overall community program of corrective and preventive measures for reducing flood damage. Community leaders should establish and enforce specific local codes and ordinances/court orders

So what's a floodplain?

The floodplain is the flat land bordering rivers and lakes. As a naturally occurring feature of the landscape, the floodplain is used to carry excess water when heavy rains cause streams to overflow.

Floodplains vary in size and shape. Small streams with steep, high banks have narrow floodplains. Others may have moderately sized floodplains. No matter what size or shape, all floodplains have one thing in common - they flood.

Floodplains are not always easily detected. Generally, they are low lying areas near streams, dry creek beds, or drainage ways - but not always. Many areas in Texas have detailed maps indicating where flood hazards are located. To find out if your home or business is in a floodplain, check with your local floodplain administrator. He should have a map showing the flood hazard areas in your community.

Residents of floodplains face the risk of flooding's devastation. Homes can be badly damaged. Property may be ruined. It is a good idea to seek protection from these losses by planning today for flooding that might occur tomorrow.

Flood Insurance

One of the best ways to lessen the impact of flooding is to purchase flood insurance. While the insurance won't stop flooding, it will repay you for most of the costs (less the deductible) associated with flood damages.

Your regular homeowners insurance policy does not cover flood damages. However, there are almost 800 Texas communities that have joined the National Flood Insurance Program, so that affordable flood insurance is available on almost any building and contents. This includes single and multi-family dwellings, mobile homes, businesses, government and farm buildings, churches and schools. Contents coverage is also available to renters.

To find out more about flood insurance eligibility and your property's exposure to flood risk, contact any licensed property/casualty agent or broker. You can also determine if your property is in a special flood hazard area by checking with the local floodplain administrator for official maps of your community.

Prepared by
Texas Department of Public Safety
Division of Emergency Management

FEMA Contract #EMW-K-0214
State Assistance Program
Federal Emergency Management Agency

DEM-22

Division of Emergency Management
Texas Department of Public Safety
Box 4087
Austin, Texas 78773

BULK MAIL
U.S. POSTAGE
PAID
Austin, Texas
Permit No. 1265

ARE YOU IN THE FLOODPLAIN?

Deweyville, TX 1983 Newton County News

Cedar Park, TX 1981 Dept. of Public Safety FIAP

IN THE EVENT OF A FLOOD

Before

When you live in a flood prone area, common sense tells you to plan ahead. Consider these items to be well prepared for a flood event.

- Buy flood insurance. There is a five day waiting period for policies to go into effect. Damages resulting from a flood in progress will not be covered. Contact your agent today.

- Learn the flood warning system in your community and then find the safest route from your home to higher ground. Practice taking the route with your entire family.

- Make a list of your possessions. By itemizing your personal property, such as your clothing, furnishings, and other valuables, you will have a good record to help prove your flood insurance claims are valid. It is a good idea to have photos of your property as well.

- Keep a battery operated radio and flashlight in working order. Have emergency food, water, and medical supplies on hand. If your home is severely flood prone, consider stockpiling sandbags, plastic sheeting and other materials which can be used to temporarily protect your property.

- Keep valuables, legal documents and insurance policies in a dry, safe place such as a safe deposit box.

During

When flood warnings are issued, and waters are rising, the safety of you and your family is the most important consideration. Keep your radio tuned to your emergency station. If you are advised to evacuate, do so immediately. Remember that flood waters can rise very rapidly in Texas. If time permits, however, there are several steps you could take to protect your property.

- Fill containers, bathtubs and sinks with clean water in case regular supplies are contaminated later.

- Shut off all utilities at the main switches and valves...water, gas, and electricity. Use caution if the area is already inundated by flood water.

- Move personal contents to higher elevations. Outdoor possessions should also be protected this way or they should be securely anchored.

---If evacuation becomes necessary---

- Move quickly and calmly. Don't wait until the last minute to leave. Take personal necessities with you including medication, eye glasses and clothing.

- Avoid already flooded areas. Use evacuation routes suggested by local officials. Do not drive over flooded areas. Roads may already be washed away. Abandon stalled vehicles and walk to higher ground.

Wichita Falls, TX 1982 City Planning

San Angelo, TX 1983 Standard Times

After

If your home has been damaged by a flood, there are a number of steps you can take to speed the recovery process.

- Wait until officials assure you that the flood danger is passed before reentering any area.

- Call your flood insurance agent. An adjuster will be sent to inspect the damage.

- Before entering the building, make sure it is not in danger of collapsing. Allow it to air to remove foul odors or gas.

- Use flashlights, not lanterns or torches when entering a building because of the possibility of gas. Watch for live electrical wires. Make certain the main power switch is turned off. Do not turn on any lights or appliances until an electrician has checked your system.

- Begin clean-up as soon as possible. Open windows and doors to dry out the building. Shovel out mud while it is still moist. Throw out perishable foods. Scrub and disinfect walls, floors and household items. Clean, dry and air clothing, rugs, bedding thoroughly.

- Drinking water should be tested and purified before using.

- Photograph damaged areas and keep records of repair activities.

DISASTER
PREPARED BY MGT. SYSTEMS DIV.

FLOOD INSURANCE DISASTER REPORT
AREA(S): GALVESTON AREA OF TEXAS

IDENT	NAME	CONG DIST	COUNTY	DATE OF ELIG.	DATE OF HAZARD	FIRM DATE	HAZARD POP.	TOTAL POP.	PROG STAT	----INSURANCE--- NUMBER OF POLICIES	AMT. (00)
480120	ANAHUAC, CITY OF	9	CHAMBERS COUNTY	750627	740628	810716	14	1881	REG	100	71742
480121	BEACH CITY, CITY OF	9	CHAMBERS COUNTY	790808	770520	830119	0	200	REG	42	18263
480119	CHAMBERS COUNTY *	9	CHAMBERS COUNTY	750710	740809	830615	1500	8712	REG	737	246365
480122	MONT BELVIEU, CITY OF	9	CHAMBERS COUNTY	790801	761224	820816	124	1730	REG	50	27335
						* TOTALS:	1638	12523		929	$ 363705

EMERGENCY PROGRAM: 0
REGULAR PROGRAM: 4
SUSPENDED: 0
NON-PART. W/MAP: 0
NON-PART. W/O MAP: 0
WITHDRAWN: 0

IDENT	NAME	CONG DIST	COUNTY	DATE OF ELIG.	DATE OF HAZARD	FIRM DATE	HAZARD POP.	TOTAL POP.	PROG STAT	----INSURANCE--- NUMBER OF POLICIES	AMT. (00)
481575	BURLINGTON COLONY MUNICIPAL UTIL DISTRICT*	0	FORT BEND COUNTY	811229	0	0	0	0	EM	4	1800
481573	CHERRY HILL MUNICIPAL UTIL DISTRICT	0	FORT BEND COUNTY	811229	0	0	0	0	EM	2	800
481574	CHIMNEY ROCK MUNICIPAL UTIL DISTRICT	0	FORT BEND COUNTY	811229	0	0	0	0	EM	8	3400
481566	CITIES OF MUNICIPAL UTILITY DISTRICT, OF CITY	22	FORT BEND COUNTY	800506	810310	0	0	4532	EM	100	44090
481576	COURT RD MUNICIPAL UTIL DISTRICT*	0	FORT BEND COUNTY	811229	0	0	0	0	EM	6	2034
481583	FIRST COLONY LEVEE IMP DIST	0	FORT BEND COUNTY	821209	0	0	6	6	EM	0	0
481485	FT BEND COUNTY LEVEE IMPROV. DISTRICT NO. 2	22	FORT BEND COUNTY	770627	810317	0	0	5500	EM	139	57537
481570	FT. BEND COUNTY MUNICIPAL UTILITY DIST. 25	0	FORT BEND COUNTY	810529	0	0	0	0	EM	7	3150
481299	FT. BEND CO. WATER CONT. & IMPROV. DIST. 4	22	FORT BEND COUNTY	770309	0	790330	0	4591	REG	345	332414
481272	FT. BEND MUNICIPAL UTILITY DIST. #2	22	FORT BEND COUNTY	760625	770311	0	217	5698	EM	120	50458
481488	FULSHEAR, TOWN OF	22	FORT BEND COUNTY	810403	0	810731	0	0	REG	8	10287
480296	HOUSTON, CITY OF	2	FORT BEND COUNTY	730914	741227	791211	13620	1594000	REG	52333	51843058
480301	KATY, CITY OF	7	FORT BEND COUNTY	750213	740628	810302	61971	-172	REG	310	251087
481567	KINGSBRIDGE MUNICIPAL UTILTY DISTRICT	0	FORT BEND COUNTY	800721	0	0	0	1540	EM	3	1350
481563	MEADOWS MUNICIPAL UTILITY DISTRICT	22	FORT BEND COUNTY	791217	0	791217	0	4015	REG	132	145636
480304	MISSOURI CITY, CITY OF	7	FORT BEND COUNTY	730829	750117	820106	4131	26982	REG	1873	1597813
480820	NEEDVILLE, TOWN OF	22	FORT BEND COUNTY	800208	0	810731	203	1400	REG	9	6178
481486	PECAN GROVE MUNICIPAL	22	FORT BEND	770627	771101	0	3600	3600	EM	36	15920

DISASTER
PREPARED BY MGT. SYSTEMS DIV.

FLOOD INSURANCE DISASTER REPORT
AREA(S): GALVESTON AREA OF TEXAS

IDENT	NAME	CONG DIST	COUNTY	DATE OF ELIG.	DATE OF HAZARD	FIRM DATE	HAZARD POP.	TOTAL POP.	PROG STAT	----INSURANCE--- NUMBER OF POLICIES	AMT. (00)
	UTILITY DIST. NO. 1		COUNTY								
480232	ROSENBERG, CITY OF	22	FORT BEND COUNTY	750721	740628	0	300	12098	EM	224	102668
481564	SIMONTON, VILLAGE OF'	22	FORT BEND COUNTY	800304	0	0	550	610	EM	84	36170
480233	STAFFORD, CITY OF	22	FORT BEND COUNTY	791016	0	820301	300	4753	REG	114	89075
480234	SUGAR LAND, CITY OF	22	FORT BEND COUNTY	750331	740531	811104	3700	4850	REG	434	311772
						* TOTALS:	88598	1674003		56291	$54906697

EMERGENCY PROGRAM: 13
REGULAR PROGRAM: 9
SUSPENDED: 0
NON-PART. W/MAP: 0
NON-PART. W/O MAP: 0
WITHDRAWN: 0

IDENT	NAME	CONG DIST	COUNTY	DATE OF ELIG.	DATE OF HAZARD	FIRM DATE	HAZARD POP.	TOTAL POP.	PROG STAT	NUMBER OF POLICIES	AMT. (00)
485461	CLEAR LAKE SHORES, CITY OF	9	GALVESTON COUNTY	700731	701023	701023	743	743	REG	288	144244
480243	CRYSTAL BEACH, TOWN OF	9	GALVESTON COUNTY	711008	760930	760930	700	723	REG	802	280867
481569	DICKINSON, VILLAGE OF	0	GALVESTON COUNTY	710408	0	710409	0	0	REG	635	467371
485468	FRIENDSWOOD, CITY OF	9	GALVESTON COUNTY	700605	700605	720303	2500	5675	REG	3098	3230152
485470	GALVESTON COUNTY *	9	GALVESTON COUNTY	710408	710408	710409	19273	17521	REG	9934	6194871
485469	GALVESTON, CITY OF	9	GALVESTON COUNTY	700529	700526	710507	61809	61809	REG	9677	5154417
485479	HITCHCOCK, CITY OF	9	GALVESTON COUNTY	700619	701117	701113	7000	6667	REG	1118	508789
481271	JAMAICA BEACH, VILLAGE OF	9	GALVESTON COUNTY	0	710408	710408	365	365	REG	273	192833
485481	KEMAH, CITY OF	9	GALVESTON COUNTY	700605	700605	701016	941	1301	REG	572	358986
485486	LA MARQUE, CITY OF	9	GALVESTON COUNTY	700529	700526	701016	2180	16131	REG	3305	2036424
485488	LEAGUE CITY, CITY OF	9	GALVESTON COUNTY	700605	700605	701120	2800	19500	REG	4078	3270502
481562	SANTA FE, CITY OF	9	GALVESTON COUNTY	710408	800902	710409	0	6564	REG	468	326640
485514	TEXAS CITY, CITY OF	9	GALVESTON COUNTY	700605	700605	701120	20205	41403	REG	9587	6056844
481585	TIKI ISLAND, VILLAGE OF	0	GALVESTON COUNTY	830415	0	830415	500	500	REG	0	0
						* TOTALS:	119016	178902		43835	$28222940

EMERGENCY PROGRAM: 0

DISASTER
PREPARED BY MGT. SYSTEMS DIV.

FLOOD INSURANCE DISASTER REPORT
AREA(S): GALVESTON AREA OF TEXAS

IDENT	NAME	CONG DIST	COUNTY	DATE OF ELIG.	DATE OF HAZARD	FIRM DATE	HAZARD POP.	TOTAL POP.	PROG STAT	INSURANCE NUMBER OF POLICIES	INSURANCE AMT. (00)
	REGULAR PROGRAM: 14 SUSPENDED: 0 NON-PART. W/MAP: 0 NON-PART. W/O MAP: 0 WITHDRAWN: 0										
480284	HARDIN COUNTY *	2	HARDIN COUNTY	731112	0	780929	4000	40721	REG	380	286757
481111	LUMBERTON, CITY OF	2	HARDIN COUNTY	790508	761122	790508	0	500	REG	92	76571
480846	ROSE HILL ACRES, CITY OF	2	HARDIN COUNTY	740308	740913	770415	48	460	REG	17	11782
480285	SILSBEE, CITY OF	2	HARDIN COUNTY	740607	740607	780501	1490	7271	REG	58	33868
480286	SOUR LAKE, CITY OF	2	HARDIN COUNTY	740603	0	771028	425	1807	REG	78	57643
	EMERGENCY PROGRAM: 0 REGULAR PROGRAM: 5 SUSPENDED: 0 NON-PART. W/MAP: 0 NON-PART. W/O MAP: 0 WITHDRAWN: 0					* TOTALS:	5963	50759		625	$ 466621
485456	BAYTOWN, CITY OF	8	HARRIS COUNTY	700717	751114	751114	1846	58238	REG	6962	5433373
480289	BELLAIRE, CITY OF	7	HARRIS COUNTY	750812	740628	810930	0	14950	REG	982	615574
480290	BUNKER HILL VILLAGE, CITY OF	7	HARRIS COUNTY	740114	740503	790417	58	3977	REG	187	331900
481568	CHELFORD CITY MUNICIPAL UTILITY DISTRICT	0	HARRIS COUNTY	800721	0	0	0	8887	EM	48	20554
480291	DEER PARK, CITY OF	8	HARRIS COUNTY	740222	740809	800815	25000	25000	REG	3300	2520934
485466	EL LAGO, CITY OF	22	HARRIS COUNTY	700814	710702	710702	2750	3324	REG	701	655967
480293	GALENA PARK, CITY OF	8	HARRIS COUNTY	741129	750221	821102	3500	10479	REG	135	51848
480287	HARRIS COUNTY *	7	HARRIS COUNTY	730914	700526	700526	90000	500460	REG	34120	32164339
480691	HARRIS CO. WATER CONTROL DIST. #93	7	HARRIS COUNTY	721103	0	0	5100	1	EM	42	17435
480294	HEDWIG VILLAGE, CITY OF	7	HARRIS COUNTY	750604	0	780526	0	2500	REG	94	146909
480295	HILSHIRE VILLAGE, CITY OF	7	HARRIS COUNTY	751213	740628	790628	145	627	REG	26	37642
480297	HUMBLE, CITY OF	8	HARRIS COUNTY	741025	771129	820916	15	9295	REG	231	111382
480298	HUNTER'S CREEK VILLAGE, CITY OF	7	HARRIS COUNTY	731127	740510	801105	180	4174	REG	180	287885
480299	JACINTO CITY, CITY OF	8	HARRIS COUNTY	750906	740628	810902	100	8953	REG	112	51972
480300	JERSEY VILLAGE, CITY OF	7	HARRIS COUNTY	741009	740405	820315	0	765	REG	405	245627
485487	LA PORTE, CITY OF	8	HARRIS COUNTY	700828	710217	710212	850	17000	REG	2906	2138954
481578	MISSION BEND MUNICIPAL UTILITY DIST. #1	0	HARRIS COUNTY	820330	0	0	0	0	EM	4	1380
480305	MORGANS POINT, CITY OF	8	HARRIS COUNTY	750707	740628	0	187	593	EM	28	10456
485491	NASSAU BAY, CITY OF	22	HARRIS COUNTY	700724	701117	701113	5100	6500	REG	1312	1476210
480307	PASADENA, CITY OF	8	HARRIS COUNTY	710702	740524	700526	250	112560	REG	11964	7727360
480308	PINEY POINT VILLAGE, CITY OF	7	HARRIS COUNTY	740701	740628	801202	60	2958	REG	169	261002
485507	SEABROOK, CITY OF	22	HARRIS COUNTY	700529	700526	710423	2500	5700	REG	1676	1307445
485510	SHOREACRES, CITY OF	22	HARRIS COUNTY	700911	701120	701120	1850	1872	REG	439	327006

```
                                        FLOOD INSURANCE DISASTER REPORT
                                          AREA(S): GALVESTON AREA OF TEXAS

                                                                DATE   DATE                                                  ----INSURANCE---
                                            CONG                 OF     OF     FIRM    HAZARD    TOTAL      PROG   NUMBER OF   AMT.
IDENT    NAME                               DIST  COUNTY        ELIG.  HAZARD  DATE     POP.      POP.      STAT   POLICIES    (00)
------   -------------------                ----  ------------- ------ ------ ------  --------  --------   ------  ---------  ------
480311  SOUTH HOUSTON, CITY OF               22   HARRIS COUNTY 750417 740628      0      3257     13900     EM           542   198466
480312  SOUTHSIDE PLACE, CITY OF              7   HARRIS COUNTY 741113      0 760211         0      1393     REG           53    53384
480313  SPRING VALLEY, CITY OF                7   HARRIS COUNTY 740731 740628 800604         0      3333     REG          137   172516
485513  TAYLOR LAKE VILLAGE, CITY OF         22   HARRIS COUNTY 700828 701117 701113       700      4000     REG          822  1035578
480315  TOMBALL, CITY OF                      7   HARRIS COUNTY 790718 750124      0       156      2734     EM            34    11733
485516  WEBSTER, CITY OF                     22   HARRIS COUNTY 701030 720519 720519       202      2142     REG          748   686414
480318  WEST UNIVERSITY PLACE, CITY           7   HARRIS COUNTY 731127      0 780526      1020     12010     REG          472   498203
        OF
                                                                                     ------   -------             -------  ------
             EMERGENCY PROGRAM: 6                                       * TOTALS: 144826    838325                 68831 $58599448
             REGULAR PROGRAM: 24
             SUSPENDED: 0
             NON-PART. W/MAP: 0
             NON-PART. W/O MAP: 0
             WITHDRAWN: 0


481559  UNCERTAIN, TOWN OF                    1   HARRISON COUNTY 790821    0 790821         0       210     REG           11     3446
                                                                                     ------   -------             -------  ------
             EMERGENCY PROGRAM: 0                                       * TOTALS:        0       210                    11 $   3446
             REGULAR PROGRAM: 1
             SUSPENDED: 0
             NON-PART. W/MAP: 0
             NON-PART. W/O MAP: 0
             WITHDRAWN: 0


481542  BROWNDELL, TOWN OF                    2   JASPER COUNTY 820330 790619      0         0       243     EM             0        0
480383  JASPER, CITY OF                       2   JASPER COUNTY 750702 740329 810102         0      6959     REG            6     2540
480384  KIRBYVILLE, CITY OF                   2   JASPER COUNTY 750612 740510      0       732      1869     EM            16     4333
                                                                                     ------   -------             -------  ------
             EMERGENCY PROGRAM: 2                                       * TOTALS:      732      9071                    22 $   6873
             REGULAR PROGRAM: 1
             SUSPENDED: 0
             NON-PART. W/MAP: 0
             NON-PART. W/O MAP: 0
             WITHDRAWN: 0


485457  BEAUMONT, CITY OF                     9   JEFFERSON     700619 700902 701030      1300    118102     REG         8241  6442552
                                                  COUNTY
480878  BEVIL OAKS, TOWN OF                   9   JEFFERSON     760719 770513 830106        20       663     REG           45    20182
                                                  COUNTY
485474  GRIFFING PARK, TOWN OF                9   JEFFERSON     700717 701117 701113      1746      1746     REG          123    79516
                                                  COUNTY
485475  GROVES, CITY OF                       9   JEFFERSON     700529 700326 701113      1126     18240     REG         2142  1159376
                                                  COUNTY
480385  JEFFERSON COUNTY *                    9   JEFFERSON     700630 770830 830601         0     14335     REG          552   186880
```

```
DISASTER
PREPARED BY MGT. SYSTEMS DIV.
                                           FLOOD INSURANCE DISASTER REPORT                                          PAGE  5
                                             AREA(S): GALVESTON AREA OF TEXAS

                                                          DATE    DATE                                                ----INSURANCE---
IDENT     NAME                        CONG                OF      OF      FIRM    HAZARD    TOTAL      PROG     NUMBER OF    AMT.
------  ------------------            DIST  COUNTY        ELIG.   HAZARD  DATE    POP.      POP.       STAT     POLICIES     (00)
                                      ----  ------------  ------  ------  ------  --------  --------   ------   ---------  ------
                                            COUNTY
485485  LAKEVIEW, TOWN OF                9  JEFFERSON     700529  700526  701113      3567      3567   REG            134     58920
                                            COUNTY
485492  NEDERLAND, CITY OF               9  JEFFERSON     700828  700827  701113      7000     16810   REG           1709   1021845
                                            COUNTY
485499  PORT ARTHUR, CITY OF             9  JEFFERSON     700529  700526  701113     61195     61251   REG           7240   3864964
                                            COUNTY
485500  PORT NECHES, CITY OF             9  JEFFERSON     700925  701117  701113         0     13944   REG           1122    803149
                                            COUNTY
                EMERGENCY PROGRAM: 0                                          ------   -------                 -------   ------
                REGULAR PROGRAM: 9                                  * TOTALS:  75954    248658                   21308 $13637384
                SUSPENDED: 0
                NON-PART. W/MAP: 0
                NON-PART. W/O MAP: 0
                WITHDRAWN: 0


                EMERGENCY PROGRAM: 0                                          ------   -------                 -------   ------
                REGULAR PROGRAM: 0                                  * TOTALS:      0         0                       0 $       0
                SUSPENDED: 0
                NON-PART. W/MAP: 0
                NON-PART. W/O MAP: 0
                WITHDRAWN: 0


                EMERGENCY PROGRAM: 0                                          ------   -------                 -------   ------
                REGULAR PROGRAM: 0                                  * TOTALS:      0         0                       0 $       0
                SUSPENDED: 0
                NON-PART. W/MAP: 0
                NON-PART. W/O MAP: 0
                WITHDRAWN: 0


                EMERGENCY PROGRAM: 0                                          ------   -------                 -------   ------
                REGULAR PROGRAM: 0                                  * TOTALS:      0         0                       0 $       0
                SUSPENDED: 0
                NON-PART. W/MAP: 0
                NON-PART. W/O MAP: 0
                WITHDRAWN: 0

480439  CLEVELAND, CITY OF               2  LIBERTY COUNTY  750408  740308       0       425      5627   EM              24     10016
481101  DAISETTA, TOWN OF                2  LIBERTY COUNTY  791114  760702  820615         0      1177   REG              1       173
480440  DAYTON, CITY OF                  2  LIBERTY COUNTY  750319  740628       0        26      4913   EM              22      7788
```

```
  DISASTER
  PREPARED BY MGT. SYSTEMS DIV.                                                                                   PAGE  6
                                          FLOOD INSURANCE DISASTER REPORT
                                             AREA(S): GALVESTON AREA OF TEXAS

                                                        DATE    DATE                                                ----INSURANCE---
                                   CONG                  OF      OF     FIRM     HAZARD      TOTAL      PROG    NUMBER OF      AMT.
IDENT    NAME                      DIST   COUNTY        ELIG.   HAZARD  DATE      POP.        POP.      STAT    POLICIES       (00)
------  --------------------       ----  ------------- ------  ------  ------  ---------   ---------   ------   ----------   -------
481270  HARDIN, CITY OF               2  LIBERTY COUNTY 760601       0       0         3         200     EM             1       450
480438  LIBERTY COUNTY *              2  LIBERTY COUNTY 750506  770524       0         0       15294     EM           239     71093
480441  LIBERTY, CITY OF              2  LIBERTY COUNTY 760304  741220       0       586        5591     EM           129     52650
481269  PLUM GROVE, CITY OF           2  LIBERTY COUNTY 760601  790619       0        50         200     EM             0         0
                                                                                  ------    --------               -------    ------
              EMERGENCY PROGRAM: 6                                    * TOTALS:   1090       33002                   416  $ 142170
              REGULAR PROGRAM: 1
              SUSPENDED: 0
              NON-PART. W/MAP: 0
              NON-PART. W/O MAP: 0
              WITHDRAWN: 0


480499  NEWTON COUNTY *               2  NEWTON COUNTY  750604  770705       0      2462       10128     EM            43     10941
                                                                                  ------    --------               -------    ------
              EMERGENCY PROGRAM: 1                                    * TOTALS:   2462       10128                    43  $  10941
              REGULAR PROGRAM: 0
              SUSPENDED: 0
              NON-PART. W/MAP: 0
              NON-PART. W/O MAP: 0
              WITHDRAWN: 0


480511  BRIDGE CITY, CITY OF          2  ORANGE COUNTY  731217  740524  820902       100        8164     REG         1113    428626
480510  ORANGE COUNTY *               2  ORANGE COUNTY  701106  770311  830106         0       81822     REG          981    340520
480512  ORANGE, CITY OF               2  ORANGE COUNTY  740115  740614  830106     14320       24457     REG         1276    413170
480697  PINE FOREST, CITY OF          2  ORANGE COUNTY  740703  741213  830216         4         512     REG            1       250
480513  PINEHURST, CITY OF            2  ORANGE COUNTY  701231       0  830106         0           0     REG          115     40861
480514  VIDOR, CITY OF                2  ORANGE COUNTY  731127  740322  830106       200       12117     REG         1002    352853
480515  WEST ORANGE, CITY OF          2  ORANGE COUNTY  740411  740531  830106       116        4820     REG           91     22762
                                                                                  ------    --------               -------    ------
              EMERGENCY PROGRAM: 0                                    * TOTALS:  14740      131892                  4579  $ 1599042
              REGULAR PROGRAM: 7
              SUSPENDED: 0
              NON-PART. W/MAP: 0
              NON-PART. W/O MAP: 0
              WITHDRAWN: 0


                                                                                  ------    --------               -------    ------
              EMERGENCY PROGRAM: 0                                    * TOTALS:      0           0                     0  $       0
              REGULAR PROGRAM: 0
              SUSPENDED: 0
              NON-PART. W/MAP: 0
              NON-PART. W/O MAP: 0
              WITHDRAWN: 0
```

```
DISASTER
PREPARED BY MGT. SYSTEMS DIV.
                              FLOOD INSURANCE DISASTER REPORT                                  PAGE  7
                                AREA(S): GALVESTON AREA OF TEXAS

                                                     DATE    DATE                                                ----INSURANCE---
IDENT    NAME                      CONG               OF      OF     FIRM     HAZARD    TOTAL     PROG    NUMBER OF    AMT.
------   -------------------       DIST   COUNTY     ELIG.   HAZARD   DATE      POP.      POP.      STAT    POLICIES     (00)
                                   ----   -------------  ------  ------  ------  --------  --------  ------  ---------  ------


                                                                              ------    -------              -------    ------
                                                     ***GRAND TOTALS***       455019    3187473              196890  $157959267
  28                                                 EMERGENCY:
  75                                                 REGULAR:
  0                                                  NON-PART. W/MAP:
  0                                                  WITHDRAWN:
  0                                                  SUSPEND:
  0                                                  NON-PART. W/O MAP:
```

STATEMENT OF DICK WHITTINGTON, REGIONAL ADMINISTRATOR, U.S. ENVIRONMENTAL PROTECTION AGENCY—REGION VI

Good morning, Mr. Chairman and Members of the Subcommittee. I appreciate the opportunity to talk about EPA's response to Hurricane Alicia as it relates to programs under EPA's jurisdiction. Our responsibilities included responding to environmental emergencies under the Comprehensive Environmental Response, Compensation, and Liability Act, commonly known as Superfund; supporting the Federal Emergency Management Administration (FEMA) under the Federal Disaster Relief Act; and responding to the requirements of the Resource Conservation and Recovery Act (RCRA), the Safe Drinking Water Act, and the Clean Water Act.

I would now like to begin describing in detail our emergency response activities before, during, and after the hurricane.

When it became apparent that the hurricane was going to hit the Houston/Galveston area, my staff began to call our various contacts. We alerted our Headquarters offices to the possible need for Superfund monies for emergency clean up, for which provisions were made. We established back up and technical support at the Headquarters level. We contacted both the Austin and Houston offices of the Texas Department of Water Resources (TDWR), as the TDWR has been designated by the Governor to be the lead State agency for Superfund activities. We agreed to share information on the six sites in the area on the Superfund National Priorities List as soon as it became available. Those sites are French Limited, Sikes Pit, Highlands Acid Pit, Geneva, Motco, and Crystal Chemical. We then contacted our Environmental Monitoring Systems Laboratory in Las Vegas, directed an aerial overflight of the sites as soon as possible, and requested an oral report of the pilot's observations when the flight was completed.

While the hurricane was coming ashore on Thursday, August 18, 1983, we talked with Mr. Melvin Whiddon who lives near the French Limited site. Although he was unable to visually observe the site due to high winds and rain, he was able to report on the level of the flood waters near his home. Based upon our previous experience, we were able to conclude that the French Limited site was not flooded at that time. Also, since less rainfall had occurred than was predicted, we felt reasonably sure that no flooding would occur. We talked to the contractor who had worked on the Crystal Chemical site and, although he could not leave his home at the time, he promised to drive by the site as soon as weather conditions would permit.

On Friday, August 19, 1983, Charles Gazda, my Emergency Response Branch Chief who is here with me, coordinated the implementation of an initial inspection of the sites. The TDWR would send personnel from their Houston office to inspect each of the sites as soon as conditions permitted. Our Las Vegas office notified us that the weather had cleared enough to photograph the sites from the air and that they could provide us with their visual observation Friday night. We received those observations at 10:45 p.m. on our 24-hour emergency phone. The report indicated that no major damage or problems were observed at any of the sites, although there was debris around the French Limited, Sikes, and Geneva sites. The Crystal Chemical contractor reported that he had driven by the Crystal site and did not observe any major problems.

Pursuant to the Disaster Relief Act, EPA usually participates in the damage assessment surveys of public utilities for federally declared disasters. On Friday afternoon, we began discussing with FEMA the extent of EPA's disaster assistance participation. At my direction, Wally Cooper, our emergency response coordinator for FEMA activities, began preparing EPA personnel for disaster assistance duty.

On Saturday, August 20, 1983, our Las Vega office reported their interpretation of the aerial photographs that had been taken of Friday. The photographs verified their Friday observations. No major damage had occurred at any of the sites as a result of the hurricane; however, it appeared to Las Vegas that the Motco pit had little remaining freeboard. The TDWR reported that the pits on the Geneva site were overflowing and that they would enforce the existing State order to require the owner to pump the contents of the pits into on-site storage tanks. They also reported that two sections of security fence around the Geneva site had been blown over and they would likewise order the owner to repair the fence.

On Sunday, August 21, 1983, our Emergency Response Branch staff was on alert for possible emergency action.

On Monday, August 22, 1983, we received the aerial photographs from Las Vegas and decided to inspect the sites on Tuesday, August 23, with the TDWR. In addition, Wally Cooper attended a FEMA briefing in Houston to define and coordinate EPA's role in the disaster assistance effort.

On Tuesday, August 23, all six sites were inspected by EPA and TDWR personnel. Due to communication and transportation problems resulting from the hurricane, EPA and State personnel were unable to conduct joint inspections. The Motco site was inspected jointly by EPA and representatives of the Galveston County Health Department. Our field inspector reported that while the dikes around the Motco pit appeared to be stable, the pit had only two inches of freeboard. It appeared that the pit was filled by tidal waters rather than rainwater. Some contaminated water may have been released when this occurred. However, we believe that little, if any, material left the site because the floating material in the pit before the hurricane was still in the pit after the hurricane. I immediately approved Superfund monies to treat and discharge the contaminated water according to a prior plan developed by EPA and Texas. The Crystal Chemical site received some damage to the security fence and some erosion of the protective clay cap. I approved Superfund monies to correct these problems.

Our observations at the Geneva site were essentially the same as the State reported on Saturday, August 20. Since the State was requiring the present owner of the Geneva site to prevent any discharge from the site, there was no need to approve Superfund monies for emergency action. However, if the maintenance of this site exceeds the owner's or State's capabilities, we will be available to assist with emergency Superfund monies. There appeared to be no problems requiring emergency action at the French Limited, Sikes Pit, and Highlands Acid Pit sites.

None of these emergency actions, as a result of the hurricane, have resulted in the need for disposal of debris contaminated with hazardous waste. However, should there have been such a need, we would have disposed of such material at a federally approved hazardous waste disposal site under the authority of Resource Conservation and Recovery Act (RCRA). Disposal of all other debris resulting from the hurricane is under the jurisdiction and responsibility of the State.

On Thursday, August 25, we dispatched five EPA engineers to the FEMA field office in Houston to meet with Wally Cooper, our coordinator, to begin their FEMA assignments. Each EPA person was teamed with a State representative and started the damage assessment surveys of public utilities that afternoon. As of this date, we are still providing a staff of six technical personnel to FEMA.

At this time, I would like to discuss the impact of Hurricane Alicia on other areas for which EPA has regulatory authority.

First, I would like to discuss RCRA responsibilities. Our preliminary conversations with the State indicated that some hazarous waste facilities incurred damage during the hurricane. RCRA regulations require that a facility which treats, stores, or disposes of hazardous waste must notify the designated on-scene coordinator or the EPA National Response Center in instances of threats to human health or the environment. We did not receive any such notices during the hurricane or immediately thereafter. The RCRA regulations further state that any releases of hazardous waste after an incident must be reported in writing within 15 days to EPA or, if the program is delegated, to the appropriate State agency. The TDWR has been delegated the responsibility to administer this part of the RCRA program and is authorized to receive any such report. The report must address administrative details, information relative to materials lost, quantities, the amounts recovered, and an assessment of hazards to human health and the environment. TDWR is presently compiling and reviewing information relative to the number of hazardous waste facilities damaged and the extent of the damage, and EPA stands ready to assist them if any follow up actions are required.

Second, I would like to discuss our Safe Drinking Water Act responsibilities. The principal water supply systems that were affected by Hurricane Alicia were the cities of Houston and Galveston. Due to loss of electrical power, these systems were unable to maintain water pressure and had insufficient auxiliary power sources and elevated storage to sustain them. As many as 1,500 water systems in the Houston area were without power and water during the storm. An estimated total of three million people were affected. Other large systems such as Baytown, Clear Lake City, and Texas City also sustained damage but were able to maintain water pressure throughout the emergency. The Texas Department of Health (TDH) has been delegated primacy to implement the federal public water supply program. The Department worked with the State Emergency Operating Center to provide water to those utilities who lost water pressure for sustained periods. In addition, the Department issued general orders to water supply utilities to maintain high chlorine residuals to the extent possible and in specific instances, issued boil orders. Utilities were also instructed to take microbiological samples of their water if they suspected contamination. My staff consulted with State health officials in effectuating the necessary precautions, and we will continue to work with them to insure that the citizens have a safe water supply.

Finally, I want to talk about our responsibility under the Clean Water Act, which is to require compliance with Federal wastewater discharge permits. Some 60 to 70 wastewater treatment plants within the Houston/Galveston area were damaged during Hurricane Alicia. As of September 15, 1983, about 60 had been inspected and an assessment of damages prepared for FEMA by the EPA disaster assistance team. The harm to these plants ranged from electrical power failures to severe structural damage. Most of the plants are currently back in operation, operating at or about 50 to 60 percent efficiency. We expect all facilities to proceed in good faith and repair the storm damage as rapidly as possible. We will be monitoring the compliance of the Houston/Galveston area dischargers through our normal EPA permit compliance tracking system and will not hesitate to take appropriate actions if needed.

That is the extent of my testimony. I will be happy to respond to any questions you may have. Thank you.

STATEMENT OF COL. ALAN L. LAUBSCHER, DISTRICT ENGINEER, GALVESTON DISTRICT, CORPS OF ENGINEERS

INTRODUCTION

Mr. Chairman, gentlemen, I appreciate this opportunity to appear before this subcommittee to discuss Corps of Engineers efforts associated with Hurricane Alicia.

Before getting into my presentation I want to introduce two of the Galveston District staff members with me today—Mr. Joe Trahan, Chief of Engineering and Planning Division, and Mr. Ed McGehee, Chief of the Construction-Operations Division who will assist me in any questions at the end of my presentation.

It is appropriate to stress at the beginning that hurricanes are quite possibly the most dramatic and destructive of all natural phenomena. The 1900 hurricane which struck Galveston resulted in the loss of over 6,000 lives. During the 20th century, hurricanes have struck the Texas coast 33 times, averaging one every two and one half years. With the rapid growth in the coastal zone, the potential for property loss and death from hurricanes is continually increasing.

The fully developed hurricane, spinning much like a top, may have rotating winds in excess of 200 miles per hour. This can result in considerable wind damage as well as high tides, perhaps 15 feet above normal along the coast, to more than 20 feet in the upper bay.

My comments today will include a brief overview of the hurricane picture as it relates to the Texas Gulf coast and the Corps of Engineers. I will be glad to provide for the record more detailed information on any item I discuss.

In order to present a complete picture of Corps efforts associated with Hurricane Alicia I have organized my presentation to first discuss the long-term efforts that the Corps has taken to reduce hurricane damage. Next I will discuss the Corps' role immediately prior to and after the hurricane, including the damages caused by Alicia and the damages prevented through Corps hurricane protection projects.

CORPS HURRICANE PROTECTION PROJECTS AND STUDIES

In our efforts to minimize the damages caused by hurricanes in this area of Texas, the Corps has completed four hurricane protection projects. One is the Galveston Seawall, constructed in increments since 1902. The other three projects are located along the Texas coast at Port Arthur, Texas City, and Freeport. The three projects protect a total area of over 140 square miles. Heavy rainfall associated with hurricanes is a major problem. In cooperation with Harris County, four major flood control projects have been constructed by the Corps of Engineers in the area affected by Alicia. They have served to prevent substantial flood damage over the years. The four projects are the Addicks and Barker Reservoirs, which are flood control detention reservoirs providing limited protection to the major metropolitan area of Houston: Brays and White Oak Bayous, which are concrete-lined flood control channels in Houston and Vince Bayou in Pasadena.

The Corps has also investigated measures to protect the Texas coast from the high tides associated with hurricanes. A study completed in 1979, identified a number of protection systems which were economically feasible. However, these projects were not recommended for authorization in our report because potential local sponsors for such projects did not provide the 30 percent local cost sharing.

An important flood control study addressing the heavy rains brought by hurricanes is currently ongoing for the Houston metropolitan area. This study addresses channel improvements and other measures which may be justified to reduce damages from heavy rainfalls.

Another area of Corps involvement concerning hurricanes is beach restoration. A beach restoration study is nearing completion and there is an indication that several projects near Galveston and at Freeport may be economically justified. The local communities' capability and willingness to meet the required items of local cooperation is a matter to be resolved.

The final hurricane related function the Corps is involved in is in the area of hurricane contingency planning. There is a critical need for contingency planning to minimize the threat to life during hurricanes along the Texas coast. The Federal Emergency Management Agency, through its Disaster Preparedness Assistance Program, initiated a program in 1982, with grants to the states which are susceptible to hurricanes. These grants are to evaluate the areas' vulnerability and develop contingency plans. This program is currently underway by the State of Texas. Our primary support effort will be the use of our expertise in evaluating the vulnerability of areas along the Texas coast. I cannot overemphasize the critical need and importance of this endeavor.

PRE-HURRICANE

I want to shift gears now and discuss Corps of Engineers actions immediately prior to and after Hurricane Alicia. The COE has a limited role in protection of the populace immediately before a hurricane hits and during the actual storm. Prior to the storm, the Galveston District safeguarded Corps equipment and property, notified its contractors of the impending danger, contacted local sponsors to assure proper operation of hurricane protection projects, notified FEMA of our efforts and commenced coordination with them and established our hurricane emergency operations center.

HURRICANE

Alicia made landfall on West Galveston Island early on the morning of 18 August with 115-mile per hour winds and spread rainfall over an area of 10,000 square miles along the immediate Texas coast.

The most intense rainfall—measuring about 9 inches—was over the City of Houston central area. The rainfall radiated out from that point to the east; 5 inches in Jefferson County and to the west 5 inches in Brazoria County. Tides along the Texas coast were 10 feet above normal at landfall, 5½ feet to the south at Freeport and 5 feet to the east at Port Arthur. In Galveston Bay, tides were 9 feet near the Texas City Hurricane-Flood Protection project, and 10 feet at Baytown.

The Corps of Engineers is authorized under Army Regulation (500-60) to take immediate action in urgent emergencies: to save human life, prevent immediate human suffering, or mitigate major property damage. Such actions are limited to use of Government personnel and do not include contractor help. During Alicia, Corps of Engineers assistance under this authority was not requested.

POST-HURRICANE

Immediately after Hurricane Alicia slammed into the Texas coast, the Galveston District implemented its standard post hurricane procedures. These include immediate damage surveys to determine a rough extent of damage. This information is forwarded to our higher headquarters and to other Federal agencies. Engineer teams are then dispatched to obtain data on the extent of flooding and associated damages. Damages are incurred from two sources . . . flooding and from alteration of our navigation projects. Information obtained on flooding is vital in analyzing the effectiveness of completed projects and in planning of future projects.

Alicia's tidal flooding damages are estimated at approximately $123 million and the stream flooding damages are estimated at $27 million. On the other hand, it is estimated that the Galveston Seawall alone prevented about $100 million in damages. The recently completed hurricane protection projects at Texas City and Freeport are estimated to have prevented an additional estimated $16 million in damages.

Hurricane damages to navigation projects are primarily in two ways. First, hurricane waters move silt into navigation channels, reducing channel depths; secondly, levees surrounding dredged material disposal sites are damaged by high waves. It is estimated that approximately $21 million will be required to restore navigation projects damaged by Alicia. Fortunately, no channels were shoaled or obstructed to the point of delaying navigation. However, there was extensive damage to Galveston

Channel, Texas City Channel, Houston Ship Channel, Gulf Intracoastal Waterway, and minor damage to Freeport Harbor and the Sabine-Neches Waterway.

We were fortunate in the matter of sunken vessels. Many barges and smaller recreational craft were blown about during the storm, but these were retrieved by the owners. We do have a section of a sunken grain carrier creating a navigation hazard near the Galveston Gulf Entrance Channel for which have taken steps to have removed.

Another authority under which the Corps can provide emergency assistance is Public Law 84-99. This covers flood fighting and rescue operations, and repair or restoration of flood control works affected by the storm. This assistance was not required during Alicia.

Public Law 93-288, the Disaster Relief Act of 1974 authorizes Federal assistance to state and local governments. The Federal Emergency Management Agency has been designated by the President to administer the Act and provide overall responsibility for relief work. In this area the Corps has assisted FEMA by providing members for Hurricane Alicia Damage Report Survey Teams. These teams estimate damages to public facilities and the costs of debris removal. The Corps has also provided assistance to cities in the preparation of their debris removal contracts.

All told, members of the Corps of Engineers have completed 859 Damage Survey Reports. On September 21 four additional counties were designated for public assistance programs. There are now nine counties included in our mission and recently we were given the additional assignment of monitoring debris removal contracts. We expect to complete our mission about 15 October.

This concludes a brief review of Corps actions prior to and following Hurricane Alicia. I will be pleased to answer any questions you might have.

Mr. Roe. Please proceed.

TESTIMONY OF JOSEPH WINKLE, ASSISTANT ASSOCIATE DIRECTOR FOR DISASTER PROGRAMS, FEDERAL EMERGENCY MANAGEMENT AGENCY, ACCOMPANIED BY ROBERT BROUSSARD, FEDERAL COORDINATING OFFICER, HURRICANE ALICIA, AND DONALD COLLINS, ASSISTANT ADMINISTRATOR FOR FEDERAL INSURANCE ADMINISTRATION; GEORGE L. DARBY, AREA DIRECTOR, DISASTER AREA 3, SMALL BUSINESS ADMINISTRATION; ROBERT A. LANSFORD, STATE COORDINATOR, GOVERNOR'S DIVISION OF EMERGENCY MANAGEMENT, TEXAS DEPARTMENT OF PUBLIC SAFETY; COL. ALAN L. LAUBSCHER, COMMANDER, GALVESTON DISTRICT, CORPS OF ENGINEERS; AND DICK WHITTINGTON, REGIONAL ADMINISTRATOR, DALLAS REGIONAL OFFICE, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. Winkle. Thank you, Mr. Chairman. I will summarize the statement that we have submitted for the record.

We are happy to be here today to share with you our activities. Perhaps briefly I should comment on the types of assistance that is offered as a result of the President's disaster declaration in this instance. It is substantial.

Mr. Roe. Mr. Winkle, can, if you will forgive me, I think it would be helpful for the record for those that are here just to quickly summarize what activates your organization, what steps are taken. I think that is important because there has been some overtones of concern on the exigency of how you respond.

I think it would be good to get into the record the restraints you have under the law, if you would do that briefly.

Mr. Winkle. I would be glad to, sir. We are activated as a result, of course, of an incident. And as far as implementation of the programs, based upon the declaration by the President.

Mr. ROE. That is also in degrees, is it not? There are two different types of declaration.

Mr. WINKLE. That is correct; both, for emergency there is a provision to make an emergency declaration by the President, in situations where there is a need for only specific types of assistance. Then the one for a major disaster declaration, which we have here, is a result of Hurricane Alicia, which brings forth all the assistance provided for under the authorities of the Public Law 93-288 as well as triggering the assistance of a number of other Federal agencies under their own authorities.

Mr. ROE. You are the umbrella agency.

Mr. WINKLE. Yes, sir.

Mr. ROE. Go ahead.

Mr. WINKLE. OK. Under Public Law 93-288 there are two areas of assistance basically: assistance to the individuals and then assistance to the local governments. As you have heard this morning, Mr. Chairman, the local governments outlining the things that they have been most involved in, of course, being debris removal. In addition, of course we do assist in providing the, on a cost-sharing basis, for the restoration of their other damaged public facilities.

At this point in time, sir, we have completed the process wherein we go in with a State representative and local representative to scope out the work. And we have developed 1,277 projects for local government assistance. We refer to those as damage survey reports. I think some of the local officials this morning referred to these. The acronym used is DSR's.

This identifies the scope of work that would be eligible and assigns a cost estimate to it. Based upon these various projects in these damage survey reports, then there is a project application developed for each local government. And once that then is developed and approved we can begin to advance moneys to the local governments to provide them some capital in order to continue with the repair and restoration of these publicly owned facilities.

At the present time, sir, these 1,277 projects, the cost estimates to accomplish that work is $31,900—$31,932 million of which $23.1 million of that is for debris removal. We have had in excess of 16,000 individuals at the disaster assistance centers or service centers, seeking help for the various programs that we have represented in those centers, principally for temporary housing, for the disaster loan programs that are administered by the Small Business Administration and Farmers Home Administration, as well as the disaster unemployment assistance benefits.

And the individual and family-granted assistance, which is administered by the State with a cost sharing of Federal and State moneys. FEMA also has the responsibility for administering the Federal insurance program. Mr. Don Collins, who is assistant administrator of the Federal Insurance Administration is here with us today. At the present time, to date, there have been 11,519 claims filed under the floor insurance program.

And finally, payment has been made on 671 cases, with advances paid on a great number more; 439 cases have been closed without payment either because the damage was below the deductible or was covered by other insurance such as wind damage and under the regular homeowner's insurance policy. So this leaves a total as of right now of 10,409 cases that are open.

As Mr. Collins can further amplify, their work force is in place to begin a process of 400 to 500 cases daily now. There are a couple of things I would like to mention, Mr. Chairman, as Mr. Vessey, with the Red Cross was here just a few moments ago, had indicated, we are interested in pursuing with your committee some amendments to the Disaster Relief Act. And we have submitted some proposals. And you have at the present time, I believe, the House, H.R. 3430 which contains our proposals.

We are very interested in pursuing, particularly in the area of preparedness, that you have indicated some interest in here today of increasing the amount of moneys that we can make available. As you perhaps recall, we have a provision under the act to provide a limited amount of funds to a cost-sharing basis to the State to do preparedness actions, to better prepare the State and, in turn, the local governments, to deal with disasters. And part of our proposal is that we feel that this amount of money should be increased.

Another proposal that we are making, sir, and we feel has great value and will be extremely cost effective, is a proposal to provide some funding for hazard mitigation. We are very active in hazard mitigation, but do not have any funding mechanism in order to stimulate some very worthwhile projects.

Mr. ROE. Would you amplify on hazard, for the record, what you refer to as hazard mitigation?

Mr. WINKLE. All right, sir. These would be opportunities that would present themselves as a result of a disaster where we envision relatively small amounts of money that we could provide on a cost-sharing basis with the State and our local government that would provide, we might refer to it as disaster proofing. For example, there are many parts of the country wherein we have in the flood plain areas repetitive floods. Every few years we find ourselves having major floods and are in there with disaster relief programs. Currently all we can do is, we are limited by statute to return these facilities back to their predisaster condition. With some additional funding, and we would look at this as being in most cases a relatively small amount in addition to provide some additional work that could protect these facilities.

Mr. ROE. What you are basically saying, and I couldn't agree with you more, is that if we have a sewage disposal plant that could be protected that is going to overflow into water courses, and instead of just repairing a pump here and there we ought to be doing something to protect it.

Mr. WINKLE. That is right, sir. And bridges we find ourselves replacing repeatedly we could make a little larger water opening. So there are two additional proposals that in your deliberations as you take these up we would be glad to visit with you further.

That would conclude my remarks in summary.

Mr. ROE. That is the framework. Let's hear from Mr. Darby.

Mr. DARBY. Yes, sir. Thank you very much. We appreciate the opportunity to be here, first of all, to give you an idea of the scope we have seen thus far. As of last Wednesday we had interviewed something in the neighborhood of 16,500 disaster victims, 13,800 of those being individuals, homeowners, tenants. Approximately 2,600 were businesses. As of the close of business last Wednesday we had received 1,327 applications for individual assistance, 240 applications for business assistance. We have verified losses to 817 homes and 201 businesses. Of those verified, we have processed 170 loans for approximately $1.5 million.

Average verification time so far has been about 4 days, and the average time for processing has been about 11½ days. Our best projections at this time is that by the close of business on the last day, we should see somewhere in the neighborhood of 17,000 disaster victims. We will probably receive somewhere in the neighborhood of 7,000 applications.

Mr. Chairman, in our prepared text there are comments about how our process works. I won't bother to read them here. There are a couple things I would like to comment on, particularly as regards private sector involvement we have had here in this disaster area.

Two days, or the second day after we opened our first assistance center we held a meeting on Galveston Island with every leading financial institution on the island. Six days later we had a similar meeting in Seabrook with the Kemah-Baytown area bankers. We went to these bankers and told them how our program worked. Our purpose being to see if there was a way to speed assistance to the businesses of the community, particularly to the businesses, because no matter how fast we do our business, we have to accumulate a lot of information in order to process a loan.

What we have asked the banks to do is, in effect, survey their own portfolio of clients and knowing how our program works, see if they can bring assistance to these businesses with interim short-term loans. I am very pleased to say that these interim loans are being made everywhere. We have had tremendous response from the banking community, and I think it is a real compliment to them.

In addition to that, the bankers furnished us over a 2-week period of time a total of about 56 of their employees to assist us in the centers in interviewing and screening applicants. There is a dollar savings involved. If we had had to replace those volunteers with even junior grade detailed loan officers, it would have cost the Federal Government around $15,000. But I think more importantly it shows the confidence that the bankers have in their communities to bounce back. It meant a lot to the victims.

Mr. ROE. But you have limitations because they have to demonstrate they can repay the loans?

Mr. DARBY. That is correct.

Mr. ROE. So I think it is important to put on the record that under the present structure as far as SBA is concerned, no effrontery meant at all, the rules and regulations require that regardless of the damage someone receives, if they are eligible to apply, still have to demonstrate ability to repay.

Mr. DARBY. Yes, sir, these are loans.

Mr. ROE. So there is a bit of a hole there, if someone loses their whole place—I am not being critical—there is just a hole in that part of the law that doesn't give you any grant money. It has all got to be repaid loan moneys; is that not correct?

Mr. DARBY. That is correct.

Mr. **Roe**. Have you had to turn many of them down on the basis of the fact that they were unable to demonstrate they could pay back?

Mr. **Darby**. Are we talking about strictly businesses now?

Mr. **Roe**. Either.

Mr. **Darby**. Well, on the individual side of it, as you know there is an individual and family grant program which is administered by the State. They can make grants up to $5,000. I would say that thus far, approximately 34 percent of everyone we have seen have been referred over to the individual and family grant program.

The law requires that if they are gainfully employed, or if they own real estate, they must apply to the SBA for assistance first. Obviously there are a lot of people who do have jobs and who do own real estate that do not qualify for a loan based on what their income is. We have developed a system in conjunction with the State of Texas, and the other States in our area, in which we will address that problem right up front so that they don't have to go through the entire process of filling out forms and everything. Approximately 34 percent I think is what we referred to the IFG in this disaster so far.

Mr. **Roe**. I think it would be helpful to us, there is a limitation on that. The limitation is $5,000.

Mr. **Darby**. That is correct.

Mr. **Roe**. It seems to me that, if someone has a major disaster, that in candor, in today's marketplace, $5,000 doesn't go very far. I am not again faulting the system. I am simply saying should that be looked at because of current economic loss and so forth, should that minimum be raised from $5,000 to $10,000, $12,500, whatever?

Mr. **Darby**. I would certainly let Mr. Lansford address that point. There are other resources available to us. There are exceptions. We have those people that perhaps we can't make a loan to or to whom we can make only a relatively minor loan. The grant program can only go $5,000. We have been able to work——

Mr. **Roe**. I realize that. I am just trying to get in, with the time frame, I haven't forgotten, Mr. Collins, about the insurance, we are going to get back to you yet. But the point in question, if someone has a home that they built 7 years ago or 10 years ago, the home might have cost them $60,000, $65,000 to build. They may have property insurance, they may not.

What we are coming back and saying, that if that home is completely wiped out or a business is completely wiped out, thinking about the structure itself, they are in a real kettle of fish at that point. What happens if they don't have insurance and their home is wiped out and they have paid $60,000? Now, to replace it would cost $110,000. They still have the obligation of the residual balance of their mortgage, do they not?

Mr. **Darby**. Yes.

Mr. **Roe**. So let me pose the question. The answer is yes. Then one comes back and says, well, now OK, I am going to replace my house. How do I get somebody to finance that with my loss involved unless I have some methodology to do that even if employed?

Mr. **Darby**. First, our program is limited to $50,000 to repair real estate. Under the circumstance you describe, in addition to the amount to rebuild the home we can finance the existing mortgage.

Mr. **Roe**. I just think that there is a major hole in the change in the economy that is taking place, the tremendously increased costs of real property. We might have to look into that further. I think that is reasonable. Go ahead. I am sorry.

Mr. **Darby**. That was really the main thing I wanted to point out other than the comments contained in our statement, and you have that. I think the local lending institutions, private sector involvement we have had has really just been extraordinary and we want to thank them for their help.

Mr. **Roe**. Mr. Lansford.

Mr. **Lansford**. Thank you for inviting us down here, Mr. Chairman. You have a copy of my testimony which is very short and brief, and I will not read it all.

I would like to say, though, that on behalf of the State emergency management office I would like to thank the Federal agencies—FEMA, SBA, National Weather Service, Corps of Engineers, and all the others--for assistance they have given the State of Texas during this particular activity. The cooperation and effort is not only in the recovery phase of the disaster but our preparation and mitigation response phase, also.

In Texas, no different than the Federal or local government level, we have responsibility for an emergency management program statewide to cover all phases of a disaster, prior to, after, and everything else. I think you know we have been thrusting a lot upon the recovery effort, which is very important, and we have a vital role there, also.

I would like to address some of the things of concern to me that came up with the mayors this morning. We talked about primarily the response and preparedness role. We work at a preparedness program in the State of Texas quite diligently I think. Some things came up, Mr. Chairman, that I think I have some answers for you on some of those questions that were raised. Primarily from the standpoint of the hurricane evacuation plan program that is going on in Texas.

Currently we are in a program area that started a couple years ago, where we have developed the computer run on the SLOSH modeling which gives you the oversurge. We have done that in Harris County, part of the five-county area. This fall we were starting the Lower Rio Grande Valley area and that portion is financed by the State government. Through the efforts of FEMA and their grants program we have gone to the next step, which is the vulnerability analysis. We have just finished this area, Houston-Galveston area, on the vulnerability analysis.

I say we have just finished. That $1 billion figure I think you referred to earlier that came out during the storm came from our study that is currently being done by some people at Texas A&M. We were not really ready to put that figure out yet because we didn't know how good it was going to be. But that is an analysis of a hurricane of certain windspeeds and surge tide. If it impacted a certain area, it would give us an estimate of what the dollar damage would be; that has been the second phase of the program, to determine what is going to be vulnerable in this area if a hurricane comes that way.

The third phase, we are beginning this October, again, with a grant from FEMA, is the contingency plan phase which will be that aspect that you spoke of, about what do we do in the event all this happens. Do we sandbag that particular sewer treatment plant? Do we evacuate? It could be vertical, it could be horizontal. We don't know that yet. That is the third phase of the three-phase program.

Mr. ROE. So what you are telling the committee, you are intensively working on this.

Mr. LANSFORD. Very much so. This year, for example, what Mr. Winkle was talking about, we in Texas opt for $25,000 of match money from FEMA and put $25,000 with the State, and we initiated our hurricane awareness program this year. We printed 800,000 of these and distributed along the coast, which is information for the individual citizen. I will leave these for the committee.

This particular one is the Beaumont area, but I have the Houston, Galveston, and Corpus Christi one. This is the SLOSH study. That shows this area of contingency and zone, and what would happen in certain surge types' penetration. That has gone out to local governments.

They have the computerization to determine the impact of that hurricane, its time of arrival and amount of water and things of this nature. That is all part of the SLOSH, which the local governments have. During Hurricane Alicia we were feeding that, this area, all the time through the teletype system we have for communication system of Texas. Now, we hope to continue this program. And with FEMA's funding we will.

When we get this thing completed all the way down, it will take until about 1985 to do it, then we will come back and pick up that grant program FEMA has on the match. It is $25,000 now. I understand this new law, if I am not mistaken, they are trying to raise it to $50,000 which would give us a $50,000 match to keep this thing updated and current, because a vulnerability analysis is going to change, especially in this area, every other year probably. Whatever was vulnerable then, with the growth and population changes and major shifts and things, that is going to change. So we need to keep this up to date.

So that is what we are doing. I will leave this for the committee, if you don't mind.

Mr. ROE. No objection. We will make it part of the minutes.

Mr. LANSFORD. There is on file a signed evacuation agreement between the cities of Galveston, Galveston County, south Harrison County, about who goes first.

Mr. ROE. The answer is it needs better coordination.

Mr. LANSFORD. Sure. There is no doubt about that. As was brought up this morning, we work with local governments on a day-to-day basis. We have our workshops and we have hurricane workshops and we have orientation schools back in Austin. We encourage local government, primarily from elected leadership, to put people in those areas of responsibility that we can work with, and that when a disaster occurs that person we have been working with for 1, 2, 3 years is a person who comes along and advises the mayor and county judge on things he should be doing.

That is my responsibility: to advise him. I know that is Mr. Winkle's responsibility and FEMA people, to advise the President of the United States what to do in time of disaster. So we want the same kind of thing to work at the local government level.

This morning you all talked about that on the mayors. Of course in our law we believe, our law says the chief elected official is the person who makes the decision. We understand that mayors and Governors and Presidents don't always have total knowledge all the time. But that is our job as people in my position, Mr. Winkle's position, local governments, to work with and advise elected officials on what should be done next with our recommendations. That is the kind of program we are working with and that is where we are on this.

Mr. Darby's and your comment on the $5,000; of course the $5,000 in the grant program is part of the Federal law. We can't change that. You know that. We put in 25 percent of that, the State of Texas does. Hurricane Allen, we spent about $4.8 million out of the State treasury for that program. Hurricane Alicia, I don't know, we are probably somewhere less I am sure, Joe. I don't know what. But probably right now maybe a couple million dollars.

Of course the individual family grant program is designed to help that last person down the line there that has no other type of resource, and for essential vital needs only. We know that you cannot replace everything that was lost.

I, as a State coordinating officer, have a lot of appeals come back to me after a major hurricane saying you know I have lost all of my fine china and glassware. Why can't I get more? But the law is not designed for that. Whether it should be changed or not, I don't know. I think to try and do what we are doing right now, provide those people with vital essential needs of everyday life, is a big step we are doing now we never have done before.

Mr. Roe. The law was written in Maine in 1974 so we have different economic conditions.

Mr. Lansford. That is right. I agree that probably it could be raised. But if that does take place, then, it has to be over a time period where States can get their funding and budgeting things in line, also. In the State of Texas our legislature meets every 2 years so we just met last year. It will be another 2 years before we can do any kind of budgeting.

So under those conditions, yes, maybe the grant program should be increased. We have seen where it is gradually raised. The average grant I think in Hurricane Allen was, I want to say around $1,500. I don't know if that is true or not.

Joe, do you remember?

Mr. Winkle. I cannot recall.

Mr. Lansford. But it does raise—we have had several disasters in Texas the last few years, and the economy and inflation and everything else goes up. So there may be some basis for that to be raised.

Mr. Roe. Mr. Whittington from EPA.

Mr. WHITTINGTON. Mr. Chairman, you all asked us to report on our activities as to the hurricane. We do have five separate kinds of things we do.

First of all, we have activities relative to the Superfund law, CERCLA, related to hazardous waste sites. We have activities under RCRA, activities under the Safe Water Drinking Act, and the Clean Water Act. We also do damage assessments in support of FEMA. With respect to the Superfund sites, we did identify and there is included in my written testimony six particular sites we thought might be of interest to the committee located in the hurricane area.

I would like to run over briefly what we did in connection with these sites. On Thursday, while the hurricane was coming ashore, we did our preliminary contacts with the department of water resources here in the State. The department of water resources has responsibility for implementing that law. We contacted headquarters with respect to our possible need for additional funding. We also contacted our Las Vegas office who has aerial reconnaissance ability. We did those things on Thursday.

On Friday, we consulted with the department of water resources to make arrangements for their local office to inspect the sites as soon as conditions allowed. We also directed the Las Vegas office to overfly the area to provide us with aerial reconnaissance. They did so. They reported to us on Friday the findings they secured.

We also held a meeting in my office to advise our folks who would be dispatched for damage assessment on their particular duties. On Saturday, we received the laboratory analysis of the photographs. This supplemented the pilot's verbal report on Friday night. We also received a State report. On Sunday, FEMA called us and told us to report on Monday. We did so. On Tuesday, we did complete site inspections of all of the Superfund sites that I have mentioned. We found that in the instance of three of these sites, specifically sites, for instance, the acid pits, that there were no problems of a hurricane-related nature. With respect to the Crystal Superfund site, we did find a fence had been blown down and a clay cap had eroded. I did make available emergency funding and direct that these things be corrected. In the instance of the Motco Superfund site we found that the pits were full. They had only about 3 inches of freeboard. I did authorize moneys to be expended to treat waste water and secure adequate freeboard.

In connection with the Geneva site, the State of Texas has a court order directing the owner of this site to preclude discharges from the site. They did, under the auspices of this order, direct the owner to cease the overflows which had been taking place and to fix the fence.

With respect to our hurricane damage assessment duties, we have had people in the Houston area making such assessments continually since Monday, August 21 varying anywhere from 1 to 11 people. With respect to the RCRA law or ongoing Hazardous Waste Disposal Act, there are, as you would expect, many hazardous waste facilities in the area of Houston. Under the law and regulations, if some owner-operator of such facilities is made aware of a life-threatening situation relative to hazardous waste, they are required to notify an on-scene coordinator in case we have one in the area or national response center in case we don't. We received no such notifications.

There is also provision that if there is a release of hazardous waste under RCRA, the owner-operator is supposed to notify the Texas Department of Water Resources, in this instance, since they have been delegated the implementation of this program. They are still compiling this information. There was at least six releases that I know of. Most of them were recovered.

With respect to the Safe Drinking Water Act, implementation has been delegated to the Texas State Department of Health. We did consult with them throughout the hurricane incident. I am confident that the necessary precautions were taken with respect to providing the populace with safe drinking water.

One clarification I would like to make with respect to my written testimony. I read it again on the way down this morning, and you can draw the inference from the testimony that 3 million people were totally out of water. That is not what we were trying to say. We were trying to say that systems, water supply systems that serve 3 million people had during this incident some problems, and have either low or no water pressure, as the mayor said this morning.

With respect to the Clean Water Act, we have caused many of these sewerage treatment plants to be examined. They are being inspected for damage under the FEMA program. We have so far conducted 330 assessments of various waste water treatment facilities or water utilities, the damage estimate at the moment, as I understand, is $2.1 million. All of these treatment plants that I know of are back in operation, although not fully up to their potential. We will, Mr. Chairman, insist that folks bring these facilities up to their potential as soon as possible.

That concludes the summary of my testimony. Thank you.

Mr. Roe. Colonel Laubscher.

Colonel Laubscher. Mr. Chairman, I appreciate the opportunity to appear before the subcommittee this morning. My comments today will include a brief overview of the hurricane picture as it relates to the Texas gulf coast and to the Corps of Engineers.

I would be glad to provide more detailed information for the record on any item you choose. In order to present a complete picture of the corps efforts associated with Hurricane Alicia, I have organized my presentation to first discuss the long-term efforts that the corps has taken to reduce hurricane damage.

Next, I will discuss the corps role immediately prior to and after the hurricane, including the damages that were caused by Alicia and damages prevented through corps hurricane protection projects.

In our efforts to minimize damage caused by hurricanes in Texas, the corps has completed four hurricane protection projects. One is the Galveston city wall, constructed in increments since 1902. The other three projects are located along the Texas coast at Port Arthur, Texas City, and Freeport.

The three projects protect a total area of over 140 square miles. Heavy rainfall associated with hurricanes is a major problem.

In cooperation with Harris County, four major flood control projects have been constructed by the Corps of Engineers in the area affected by Alicia. They have served to prevent substantial flood damage over the years.

The four projects are the Addicks and Barker Reservoirs, which are flood control detention reservoirs providing limited protection to the major metropolitan area of Houston, Brays and White Oak Bayous, which are concrete-lined flood control channels in Houston and Vince Bayou in Pasadena.

The corps has also investigated measures to protect the Texas coast from the high tides associated with hurricanes. A study completed in 1979, identified a number of protection systems which were economically feasible.

However, these projects were not recommended for authorization in our report because potential local sponsors for such projects did not provide the 30-percent local cost-sharing.

Another area of the corps involvement concerning hurricanes is beach restoration. A beach restoration study is nearing completion and there is an indication that several projects near Galveston and at Freeport may be economically justified. The local communities' capability and willingness to meet the required items of local cooperation is still a matter to be resolved.

The final hurricane related function the corps is involved in is in the area of hurricane contingency planning, and this was mentioned a little earlier. There certainly is a critical need for contingency planning to minimize the threat to life during hurricanes along the Texas coast.

The Federal Emergency Management Agency, through its disaster preparedness assistance program, initiated a program in 1982, with grants to the States which are susceptible to hurricanes. These grants are to evaluate the areas vulnerability and develop contingency plans, including evacuation plans.

This program, as has been mentioned, is currently underway by the State of Texas. Our primary support effort will be the use of our expertise in evaluating the vulnerability of areas along the Texas coast.

I would like to shift gears now, and discuss the Corps of Engineers actions immediately prior to and after Hurricane Alicia. The COE has a limited role in protection of the populace immediately before a hurricane hits and during the actual storm.

Prior to the storm, the Galveston district safeguarded corps equipment and property, notified its contractors of the impending danger, contacted local sponsors to assure proper operation of hurricane protection projects, notified FEMA of our efforts and commenced coordination with them and established our hurricane emergency operations center.

Alicia made landfall early on the morning of August 18. The Corps of Engineers is authorized under Army regulation 500-60 to take immediate action in urgent emergencies: to save human life, prevent immediate human suffering, or mitigate major property damage.

Such actions are limited to use of Government personnel and do not include contractor help. During Alicia, Corps of Engineers assistance under this authority was not requested.

Immediately after Hurricane Alicia slammed into the Texas coast, the Galveston district implemented its standard posthurricane procedures. These include immediate damage surveys to determine a rough extent of the damage.

This information is forwarded to our higher headquarters and to other Federal agencies. Engineer teams are then dispatched to obtain data on the extent of flooding and associated damages.

Damages are incurred from two sources, as far as we are concerned, flooding and from alteration of our navigation projects. Information obtained on flooding is vital in analyzing the effectiveness of completed projects and in planning of future projects.

Alicia's tidal flooding damages are estimated at approximately $123 million and the stream flooding damages are estimated at $27 million. On the other hand, it is estimated that the Galveston Seawall alone prevented about $100 million in damages.

The recently completed hurricane protection projects at Texas City and Freeport are estimated to have prevented an additional estimated $16 million in damages.

Hurricane damages to navigation projects occur primarily in two ways. First, hurricane waters move silt into navigation channels, reducing channel depths; second, levees surrounding dredged material disposal sites are damaged by high waves.

It is estimated that approximately $21 million will be required to restore navigation projects damaged by Alicia. Fortunately, no channels were shoaled or obstructed to the point of delaying navigation. Several channels were damaged.

Another authority under which the corps can provide emergency assistance is Public Law 84-99. This covers flood fighting and rescue operations, and repair or restoration of flood control works affected by the storm. This assistance also was not required during Alicia.

Public Law 93-288, the Disaster Relief Act of 1974, discussed earlier, authorizes Federal assistance to State and local governments. The Federal Emergency Management Agency has been designated by the President to administer the act and provide overall responsibility for relief work.

In this area the corps has assisted FEMA by providing members for Hurricane Alicia damage report survey teams. These teams estimate damages to public facilities and the costs of debris removal.

The corps has also provided assistance to cities in the preparation of their debris removal contracts.

That concludes my brief review of Hurricane Alicia and the Corps of Engineers' actions.

Mr. ROE. Mr. Collins.

Mr. COLLINS. I don't have a prepared statement.

Mr. ROE. Mr. Broussard.

Mr. BROUSSARD. Neither do I.

Mr. ROE. OK. At the outset, let me thank you very much for the substance of your presentation, both from the point of view of the actions taken by your respective agencies, and also some of the planning that you got both at the State level and Federal level for filling in some of the gaps in the testimony we had this morning.

I just have a couple of questions. Then I would defer to our distinguished Representatives from Texas.

One, Mr. Whittington, on the EPA situation, your testimony was substantive. And in this sense. That has been bothering me through the whole course of review. That, as we are developing the Superfund program identification of toxic waste, particularly, and as we are developing methodologies for temporary retention of materials, it seems to me some of that, of course, is temporary ground storage, some of it is vessel storage and so forth.

In the plan that the State is developing in Washington in the hurricane aspect of it, it seems to me a lock in there can be terribly important. Where these potential toxic hot spots may be in a particular area that would be prone for those kinds of damages because, as you well now, anything happening to one of those sites, were it overtopped, it could be disastrous to the water supply.

Is that a fair comment to make an observation?

Mr. WHITTINGTON. Yes; I think it is. But I also think that things may be taken care of more than you realize. There is a disaster council under the auspices of the State, to that council belong various State agencies, the counterpart agency of EPA insofar as relates to Superfund is the Texas Department of Water Resources and they are on the council Bob: In fact, during such instances when you have the folks assembled, a department of water resources individual is present.

Mr. ROE. I realize that. I am, being a little bit familiar with the Superfund law, to say the least. The thing that occurs to me is that if we have a vessel for temporary vessel storage, I happen to have a couple in my State at the moment, and you have a disaster with heavy rains and topovers, that could be more of an important impact upon the populace than almost anything else.

Mr. WHITTINGTON. Yes; that is true.

Mr. ROE. Now, have we identified those?

Mr. WHITTINGTON. Yes.

Mr. ROE. Are we doing things in EPA on that issue?

Mr. WHITTINGTON. Yes.

Mr. ROE. Give me some idea what. In other words, here I am sitting in this great section of Texas. I have identified 18 different sites. I have got two vessel storages that may be cyanide acid material or some sort. I am going to be doing something. If Superfund doesn't have the money 2 years down the line, maybe we will encapsulate it, but in the meantime what do we do?

Mr. WHITTINGTON. A specific example would be the case of the Geneva site which is in the Congressman's district, unfortunately. We have——

Mr. ANDREWS. I am a lot prouder of the Astrodome.

Mr. WHITTINGTON. I can appreciate that. We have underway or will have underway within the next couple of months a program which will consist of simply trying to stabilize this site by removing some materials out of the lagoon, by filling that lagoon up and capping it over, by removing the surface drums, and by providing a synthetic cover of some kind over the contaminated dirt.

All of these things simply being temporary kinds of things until the total project can be taken to completion.

Mr. ROE. But that shows your leadership, and let me commend you for that. But I am just wondering, on national policy, is that a national directive you have, or is that an incentive that you have worked out in your region of responsibility or EPA?

Mr. WHITTINGTON. Mr. Chairman, I must confess, I can't speak to the national picture in its totality. I do know that our program office did consult with us earlier last—several months ago anyway about taking stabilization type actions at the sites.

So I do know there is some kind of effort nationally. I simply don't know the full extent of it.

Mr. ROE. You represent which district?

Mr. WHITTINGTON. We represent region VI, Texas, Arkansas, Louisiana, New Mexico, and Oklahoma.

Mr. ANDREWS. Have you got a national directive from Washington EPA?

Do you know of a national directive that speaks to this stabilization issue?

Mr. WHITTINGTON. Yes. Now, I do not absolutely know that it is in writing, but I know——

Mr. ROE. I understand. What I am trying to get at, it seems to me that in the—let me digress. In my State we have 67 toxic sites of the highest order of magnitude. We have the most in the Nation.

I don't say that from the point of view of bragging about that by any stretch of the imagination, but I think you have struck upon an extraordinarily important point. In my judgment, one of the major problems, as you know, is the cost to do all of this and to be able to chemically treat them and break them down.

It is going to take years to get to that point. It seems one issue we ought to be looking at from our committee level and speaking to toxic waste partially under our jurisdiction is coming back and saying is there a dynamic stabilization program because of these potential problems throughout the country, not only having to do with Alicia, but having to do with the entire country. It is not just the idea of identifying what we have done and classifying. We ought to say the first order of priority ought to be some method of stabilization until we can move to a broader picture.

Is that reasonable?

Mr. WHITTINGTON. Yes, and I fully agree. We are in the process of doing it at Geneva. We have previously done it at the Crystal site.

We are trying to do it at all the sites in the region. Some of these things are very difficult to do. I don't know that we know how to do all of them.

Mr. ROE. I understand that. At least you are moving on them.

Mr. WHITTINGTON. Yes.

Mr. ROE. Mike.

Mr. ANDREWS. Thank you, Mr. Chairman.

For sure, one of the things Texas does have in common with New Jersey, unfortunately, are hazardous waste sites. New Jersey has 45. Our State has 11 designated sites.

One of them is the Geneva site. An immediate concern I had about this site that is in my district, and for those of you that aren't familiar with it, it is near the Gulf Freeway, just out from downtown, close to the city of South Houston.

So it is not in an outlying region. It is in the middle of a very highly densified urban area. My first concern when we knew the hurricane was upon us was what would happen to that site.

My question to you, Mr. Whittington, is what kind of situation would we have been in had we received the 10 or 12 inches of rain that we thought we were going to get?

Mr. WHITTINGTON. Well, I don't know that the additional rain in the particular instance of this site would have done a whole lot more than it did do.

But certainly that wouldn't be true in the case of some of the others, where you have large quantities of water soluable materials in open ponds. Fortunately, the contaminant at the Geneva site is PCB's which are highly insoluble.

Mr. ANDREWS. What kind of steps should we take to mitigate the problem? Had you had the tools—and the question is what tools do you need—what steps would you have taken in anticipation?

The testimony over and over again from all of our witnesses is primarily one of reaction, and not anticipation. I guess one of the goals of these hearings is to see how we can better anticipate these disasters.

In the area of toxic waste sites, what suggestion would you make to Congress to anticipate these kinds of problems?

Mr. WHITTINGTON. Mr. Andrews, I don't know that the anticipatory actions one ought to take at Superfund sites with respect to hurricanes would be any different from heavy rains because this is the prime threat as I see it.

In the case of the Geneva site, what we are proposing to do is provide a synthetic liner over the contaminated soil so that it will not be eroded away. That is a reasonable step to take at most of these sites where you have erodable materials.

In the instance of the pond at the Geneva site, or pit, it is small enough to excavate, fill, and cover over. That is a reasonable thing to do where you have ponds that are susceptible to this kind of solution.

But bear in mind that Geneva, the lagoon is not that big a thing. But here we are talking about spending $996,000 just to stabilize the site. Some of these sites where you have open ponds or lagoons that are much bigger in size, it may or may not be practical to do anything.

Mr. ANDREWS. What can we do about sites like the Motco site?

Mr. WHITTINGTON. The Motco site, as you probably know, we have adopted a policy of treating the water and trying to draw the freeboard down such that any reasonable rain would be captured and give us time to go back and repump it. In this particular instance, the Motco ponds were filled up in our opinion, at least, in part by tidal waters sloshing over the levees.

But if you cover the contaminated areas, roof over in some fashion those ponds or lagoons or pits, or whatever, that are small enough to be susceptible to that sort of strategy, and if you keep adequate freeboard in the others, that about exhausts the tools that I am familiar with.

Mr. ANDREWS. Couldn't you do that before the storm hits?

Mr. WHITTINGTON. Well, certainly. In the case of the Geneva site, we were trying to do as fast as we could. This is not a response to the storm.

Mr. ROE. I just think we ought to enter into the discussion, before we terminate, something on the insurance aspect of it. This is near and dear to my heart, this particular issue, because in some areas of the country, well, a number of things. One is identification of flood plain areas that would be eligible for the flood insurance program.

I think the second point is that, do you find that—do you work with this local area?

Mr. COLLINS. No, sir, I am from Washington.

Mr. ROE. Oh, you are from Washington. Maybe you can give us from a Washington point of view. Do we find a dropoff taking place in citizens participating in the flood control insurance program because of the economic conditions existing and so forth?

Mr. COLLINS. Actually, I think not. I will tell you why. I brought with me some of our statistics. They reflect that on December 31, 1981, we had 1,864,000 policies in force. A year later we have 1,858,000 policies, a dropoff of about 6,000. There will be fluctuations each year.

However, in 1981 we went to a 3-year policy. Many people who had a 1-year policy which would have been counted in that policy-in-force figure switched to 3. That may be part of it as well.

Mr. ROE. Yes.

Mr. COLLINS. But no, we do not see any significant dropoff in policy count. It stands at just under 1.9 million now.

Mr. ROE. Are you familiar with whether or not the areas eligible have been identified here in this region of the country?

Mr. COLLINS. Yes, sir, I think we have pretty much identified all the eligible areas in the State of Texas. We have over 17,000 communities participating nationwide, and almost 800 in Texas. There are some communities, I didn't bring the eligibility list with me, but there are some not participating that have been identified as being flood prone. I did bring with me a computer printout of eligible communities in the Houston disaster area.

I stopped at the flood insurance catastrophe office yesterday to get updates on figures. I can update Joe's figures a little bit with yesterday's closings that were a little higher. We have now closed 1,318 cases of which 782 were final payments.

We have also made partial payments in over 70 cases and closed 536 without payment; these are claims for damage which are mostly under the deductible amounts or are wind losses really that were reported to us.

Mr. ROE. What is the average coverage, or claim?

Mr. COLLINS. It is running about $4,300.

Mr. ROE. How did that stand up against the Pennsylvania situation?

Mr. COLLINS. Hurricane Agnes? I didn't draw that comparison, but I can make a comparison between the average claim cost in this event and in Texas since the inception of the program in 1968. Since the beginning, the average claim cost in Texas is $7,472. We have paid out $340 million in Texas since the inception exclusive of Alicia. Paid claims amount to 45,506 in number.

Mr. ROE. Roughly half the total payout was, in Agnes, was in Texas.

Mr. COLLINS. I don't think Agnes. That was probably Allen. In addition we are experiencing an underwriting a loss of about $180 a policy.

Mr. **Roe**. Right now?

Mr. **Collins**. Yes, sir.

Mr. **Roe**. Mr. Lansford?

Mr. **Lansford**. May I speak to that a moment, if I could. About 3 years ago, we went into a contract with FEMA for the State assistance program on flood insurance which is a very good program, by the way. We have had it in my office at least 3 years; it has been a 100-percent funded program. I have had five people on my program now.

This year we are going back 75/25 cost ratio on it. I am having to cut back to three people because that is about all I can fund out of State. Let me say that up until we started that program, which was funded by FEMA, I don't think our participation in the flood insurance program, flood plain management program in the State was where it should have been. That is one of our primary mitigation problems, those things we can do before something happens.

We also tell everybody it doesn't pay to build your house at the bottom of a creek, but we have had a lot of that going on in this State and probably other States, too. But our flood assistance program has gotten great reviews, so to speak, around the State as we have been having workshops for city and county governments public administrators; for flood plain administrators of various cities and counties. We have had them going all year round. Every time we have them, we have a great turnout.

In one of my brochures I believe I gave you there, we are beginning to turn that a little bit and come up with a reason that we need a good flood plain managment program. Yesterday, we had a coastal construction workshop in Galveston as a result of the hazard mitigation team about those kinds of things.

So I really think the program has gone a long way in the last couple years as it never has before.

Mr. **Roe**. More people are aware of it.

Mr. **Lansford**. More people are aware of it, governmental units are more aware of it. The need to have somebody involved in it all the time, we have had some cities that have gotten into some trouble this last year about not watching that program well enough. So I think it will take maybe a couple more years to really get it turned around the way we would like.

But I would hope that the Federal Government through FEMA will continue to support that program because we like it and we want to use it. I would like to have more if I can get it. But we are very satisfied with what we are getting right now.

Mr. **Roe**. Further questions, gentlemen?

Mr. **Andrews**. Just a few.

Mr. Winkle, I have got a lot of questions that I would like to ask you.

I guess our office, like other congressional offices and local offices, was just deluged with calls after this storm, wanting Federal help and assistance and wanting to know where to go and what services were available.

I must admit we were frustrated. I am sure you were as well. I know, as you have heard, our comments in some of this testimony, you may sense, I hope you do, that we see that there is a need for some changes in regulations and the law to get FEMA into a disaster area prior to a hurricane striking.

For instance, the date of the storm was the 18th. The 23d was the date you opened your first emergency center, I think I am correct, at Ellington field. Is that correct?

Mr. **Broussard**. If that is a Tuesday, that is correct.

Mr. **Andrews**. How long did that center stay open?

Mr. **Broussard**. Congressman, I am going to say it probably stayed open through Thursday. It was an unsafe facility. It was closed because we felt like it was just a dangerous-type facility. The day before we closed it down the air-conditioning blew up, and we had to move all our people out of there. So, we made the decision to close down Ellington.

Mr. **Andrews**. That points out I think one of the real problems. Had we had FEMA people on the ground the day before the storm hit, trying to look at a site, look at an area like an Ellington field, working with local officials, I think we could respond much quicker to the mayor in a small city the day after a storm rather than to be told just wait, the FEMA people will be on the way once the President OK's it, and then they come down and locate, identify and open up a site. I invite your comments on that.

Mr. **Winkle**. I would like to, sir. First, let me say that there is a great deal of activity that FEMA is involved in, not under this particular legislation we are talking about here today, which is for response to disasters, but in preparedness activities. There are a number of programs. Part of these programs Mr. Lansford is very much intimately involved in because they do flow through the State.

The underlying principle here is that the State government supplements the local efforts and the Federal Government supplement the State and local efforts. That philosophy is not only in our preparedness activities, but forms one of the underlying principles of our Disaster Relief Act here.

As such, there are programs in place that provide funding through the State—Mr. Lansford's office—and on down to the local governments, that helps provide communications, helps provide staffing for emergency, local emergency management organization.

It seems to us that rather than to try and staff the Federal Government to be in at the time when the wind is blowing and the lifesaving type activities would be taking priority, that if we are properly prepared, the local governments through the State and working with the State, can deal with these things, versus the Federal Government being there to try and guide them through these emergency type of activities.

In terms of trying to pre-identify facilities, we have made an effort to do that in the past, pre-identifying potential locations for a disaster assistance center, especially in our more vulnerable areas, such as along the coast, where we know that in time there will be a hurricane occurring. What we have found, in trying to do that, is sure enough, the one we are relying on will be the one that may be destroyed or severely damaged and would not even be available to us for the utilization of a disaster assistance center.

So it continues to be FEMA's position that the role, the best role and the best means by which we can assist State and local government is to provide for a mechanism through our preparedness programs to allow them to have the necessary staffing, to pretrain them and things of that nature, versus relying on the Federal Government to be there just before the wind starts blowing.

Mr. **Andrews**. I am not sure I agree with you, Mr. Winkle. Mayor Whitmire commented that she was not consulted about where your centers should be established. I am certainly not saying that local and State officials shouldn't participate. I think they should. No question about it.

The criticism that my office received from local mayors, and there are many in my district in southeast Harris County, was that they weren't consulted enough.

I think that we need to look with specificity at the response that FEMA made to this disaster and whether or not it is necessary to change some of the regulations. Maybe you don't have the tools. Maybe there should be a strike force that moves in.

You know, those centers are absolutely critical to the family that is absolutely devastated by this storm. And to tell them that the facilities being shut down because the air-condition doesn't work, I mean this respectfully, is not reassuring.

A center was opened on Martin Luther King Boulevard, and then shut down just within a few days for the reasons that people didn't go to it. My office was just deluged with calls from people who didn't know it was there.

How do we notify people in a community to let them know where the centers are going to be prior to the storm? How do we communicate with local citizens?

I sense that from hearing many local officials, not just Mayor Whitmire, that there was a lack of communication among themselves and with the various agencies. I think we were fortunate in this storm. I think there—we had a lot of success, but I think we also need to look hard at where we can improve and do better.

Bob, you wanted to make a comment?

Mr. **Lansford**. Yes. I would like to say one thing. FEMA, in my estimation, ours, had the greatest response from them in this hurricane that I have seen in the 15 years that I have been working with the State of Texas and this program.

We got a declaration through FEMA from the President in a shorter period of time than we have ever had before. I want Mr. Winkle to know that. We appreciate that.

They really worked hard in getting that and getting it quick, because we really cut across some bureaucratic redtape lines to get that declaration real quick.

As in every disaster we cannot and do not normally please every local government that there is, I guess. Maybe we should. I know we cannot put DAC in every city and county where you have a disaster.

Maybe a better definition of what a DAC is it is really an application center. You don't go in there and walk out with something.

It is really an application center. Immediate needs are taken care of by maybe the Red Cross Center, a person who needs a house or place to stay a night. That is where it comes from.

Again, in the training programs, as I was talking about awhile ago, as we train local governments, we tell them that if you have a

Presidential disaster declaration, one of the first things we do is set up a center.

I know we don't reach all the local governments all the time. That is one of the training activities we carry on, too. We go to them and say, "Look, we need a facility that will meet this criteria. Can you find one for us in your city?"

Of course, we try—I say "we," State and Federal Government—we try to locate those things where we think the greatest need is for the people in the area that have a need and can get to them quickly.

We do have an intense public information program. Apparently we didn't get it all out like we like to, but we do have people that work in that and nothing else.

I had three or four people down here during that period of time. I don't know how many the Federal people had. They went around to every TV, radio station, and newspaper, printing this information and distributing it, saying this is where they are going to be, this is the time they will open and this is the time they will close.

We have radio talk shows. We have an Outreach program and we try to go out and reach every person in the community and say this is where the thing is.

I am sure in an area such as this with as many people as we have we are going to probably not cover all the bases, and we certainly will try to take care of that in the future. But that is our intent there, to get a good public information program going.

Mr. ANDREWS. Please don't misunderstand me.

Mr. LANSFORD. We try to do it ahead of time, but I am like Mr. Winkle. I do not think that we can preselect DAC's, because we don't know that is going to happen. We are not even sure we are going to get a declaration until after the storm hits.

The Governor can't ask the President for a declaration until we have a disaster.

Mr. ANDREWS. That is the very point I am trying to make, Bob. I am not questioning anyone's intent. What we are trying to see is where we can make changes to make it easier for you to do your job to make sure all those bases are covered.

Of course, we are never going to do it all, but surely we can seek ways over and over again to do it better. That is the point of my question.

What I would really like—I want to pass my turn—is to be able to follow up with all of you. I know our office has been in contact with you with some written questions, and we welcome your suggestion of modifications, changes, where you think we can do better, where you think you were really successful, and where you think your agency may have fallen down some, and encourage your dialog.

That is how we will make these regulations better.

Mr. WINKLE. Yes, Congressman, and I would add any time you have some time back in Washington, I would be delighted to spend time in detail with you.

Mr. VANDERGRIFF. I know time is fast disappearing as far as our availability is concerned, but I would suggest perhaps in these written comments or further discussions with you that you give thought to your own recommendations as to whether, in terms of evacuation, that kind of authority should remain within local control.

I know we have had some discussion about that previously today. You gentlemen have had experiences in disasters over such a wide area. I would be curious about your own thinking in this regard.

But I will not pursue that point now. Time just does not allow. I would like to direct a specific comment to you, Mr. Darby, and then a question.

I am familiar with the fact that your agency has performed to such an extent that Congressman Andrews' staff tells me that they have had absolutely no complaints about your services to date.

That is my compliment to you.

Mr. DARBY. Thank you.

Mr. VANDERGRIFF. Now, I want to tell you one of my frustrations, not with you individually, but with the agency and some of its restrictions. It bears on some current legislation that may or may not materialize and become law.

The $55,000 limit on disaster home loans is administrative. It was set back, I am told, in 1971. The statutory limit on such loans is $500,000. Now, SBA, I am told, has proposed raising those limits but you have been refused that authority by OMB.

We have reported legislation, H.R. 3020, to prohibit the SBA from setting an administrative limit to less than $100,000 for real property and to less than $20,000 for personal property.

My question to you is as to whether in this particular instance your experience has been that you can send at least this one Member of Congress back to Washington tomorrow with added incentive to try to see that H.R. 3020 becomes law, at least with regard to this specific question.

In this case, or perhaps even with the abundance of your experience elsewhere, do you feel that we should try to take some steps to remove that administrative limit setting authority, or at least adjust it upward to a figure that I think might be more in keeping with today's requirements?

Mr. DARBY. First of all, Mr. Congressman, in our particular area, it has not in all honestly presented us with a problem yet.

I think that is probably because of the type disasters that we have been dealing with for the last couple of years. However, about 4 years ago I was disaster branch manager in Burbank, Calif., where we had the mud slides throughout all of southern California.

The $55,000 limit in some of those cases didn't even start. It may be a problem to us in some places here. I don't know.

I don't know how to answer that because it has not been a problem in area 3 yet. We haven't had one of those type disasters in which you are looking at just total, total devastation, block after block, home after home, where there is no insurance involved.

It just so happens down here in this particular disaster there is lots of insurance involved. So, between the insurance and what we can do, our limits, we can probably handle this one.

I do think that one can safely say that what $55,000 would buy or build in 1971 has certainly changed in the last 13 years.

Mr. VANDERGRIFF. Thank you very much. I am sorry if I have asked you to perhaps expand on a topic that might border on higher level administration making proper comments, but I am satisfied and pleased that the limitation has not been a problem for you in terms of this case.

Mr. DARBY. It has not here. Whether or not it is, say, in a place like California where your land prices are just sky high, could be a different story.

I couldn't answer that. It was for us in Burbank.

Mr. VANDERGRIFF. I think we will continue our efforts.

Mr. LANSFORD. Mr. Chairman, for the record, I would like to go on record, too, as saying we are very concerned about the possibility of the National Weather Service being scaled down. The local said that this morning.

I just wanted to get that in at the State level.

Mr. ANDREWS. We welcome your testimony.

Mr. LANSFORD. We would do anything to speak against that. We just do not think it is in the best interest of everybody for that kind of activity to take place.

Mr. ROE. We have had a very successful morning. I think it has been very productive. I want to thank Mike Andrews and Tom Vandergriff for their leadership in inviting the committee down here because it gives us an immediate oversight of exactly what the situation is and where we may be able to be further helpful.

In fact, there have been four or five things we have been making notes on, developing legislation now, as you know, for the Corps of Engineers, where we think we can make a couple corrections already.

So I think it has been productive. Again, Mike, for your leadership, and, Tom, I think it is helpful to us. I want to thank you for spending your time with us and sharing your ideas and views on the way we can improve the legislative process, and thanks for the job you are doing.

I think it has been well done. Thank you very much. The committee now will adjourn.

[Whereupon, at 12:50 p.m., the subcommittee was adjourned, subject to the call of the Chair.]

[Subsequently, the following was received for the record:]

GURC RESPONSE TO A NEED FOR INTEGRATED EMERGENCY PREPAREDNESS PLANNING IN THE HOUSTON/GALVESTON AREA

(Presented by Dr. James L. Gumnick, President, GURC, and Dr. Hugh W. Stephens, Professor, Political Science, the University of Houston)

There is an acute need for improved emergency preparedness in the Houston-Galveston area. This is especially so with respect to the threat that hurricanes pose to human life and property. Over the past six months, GURC has been discussing emergency preparedness for this region with public officials and with interested parties in the private business sector. These discussions were preliminary to receipt of a contract awarded to GURC by the Federal Emergency Management Agency (FEMA) to act as a catalyst for local efforts to develop a Port Emergency Planning System (PEPS).

FEMA is endowed with the legal authority to coordinate planning for emergency preparedness throughout the United States. This includes the PEPS program. An essential element in FEMA's approach is the exercise of regional initiative in collecting information and formulating integrated plans for emergency management. That is, recognizing that each port area has a different set of problems, within a general framework, the U.S. Government is prepared to work with regional groups of an official and private nature upon the latter's exercise of initiative in providing cooperation and resources. An impressive response from leading organizations in the Houston-Galveston area would enhance prospects of increased resource allocations through the U.S. Government and ensure that local knowledge and preferences would receive maximum emphasis within the context of national planning.

As a result of its investigations, and especially after examining the impact of Hurricane Alicia, GURC has determined that while officials of many geographical or legal entities have planned for large-scale emergencies, nearly all remain concerned because of limited resources as well as problems of coordinating the responses among agencies and between incorporated and unincorporated districts. This affects the adequacy, acceptance, and feasibility of their own plans and those of their associates. The most serious shortcoming is the absence of an integrated emergency management system.

In order to alleviate these shortcomings and move toward an integrated capability as quickly and effectively as possible, GURC has initiated task efforts toward that objective. Included are those required for a gaming exercise based on an active simulated hurricane response in which local officials will participate. Through the preparation, conduct, and analysis of the game, essential needs for improvement of emergency preparedness can be identified and ranked, in turn facilitating further remedial action. Although a complex and expensive process, GURC strongly believes that the gaming exercise will also improve emergency preparedness by helping both the well-prepared and the less-prepared. Even the best of plans can be improved as a result of active simulation, and where serious deficiencies exist, these as well as means for improvement will become apparent to the participating officials.

GURC is currently pursuing local support from the private sector for both financial aid and services in-kind to accomplish this program.

THE ALICIA STORY

How Houston Lighting & Power Company Responded to Hurricane Alicia

August 1983

33-446 O—84——17

EXECUTIVE SUMMARY

Hurricane *Alicia* caused the greatest and most widespread destruction to HL&P's system in its 102-year history. *The Alicia Story* describes HL&P's response to the hurricane. How *Alicia* affected the company is summarized below.

- 750,000 customers lost electric service--more than the total number of customers HL&P had when Hurricane *Carla* struck in 1961.

- Service was restored to all customers in 16 days. Over 80 percent of affected customers were restored within four days.

- Hurricane *Alicia's* cost to HL&P totalled $27 million through October 31.

- HL&P fielded the largest workforce of skilled personnel ever assembled to undertake storm repairs. Through October 31, storm damage had required over 400,000 hours of overtime to repair.

- All power to Galveston Island was lost.

- 600 miles of line--the distance between Houston and Birmingham--were blown to the ground.

- Approximately 8,000 miles of electric service lines were out of service.

- More than 40,000 service drops, attachments between distribution poles and customer buildings, were torn loose.

- 569 of HL&P's 1,100 distribution circuits were out of service.

- 50 of the company's 160 transmission circuits were knocked out.

- 70 HL&P and customer-owned substations were out of service.

- 6,213 line fuses were blown.

- 2,710 transformers were destroyed.

INTRODUCTION

It was Monday, August 15, when *Alicia*, the first named tropical storm of the 1983 Atlantic hurricane season, formed in the north-central Gulf of Mexico.

Although it was located more than 350 miles east of Corpus Christi and its winds were only 40 mph, the storm was drifting toward the west and forecasters warned conditions were favorable for strengthening.

At 11 p.m. Tuesday, August 16, what had been a listless tropical storm had turned into a hurricane. The National Weather Service (NWS) reported *Alicia* was packing 80 mph winds. It was located about 140 miles southeast of Galveston and the NWS warned there was nearly a 50-50 chance that it would come ashore at Galveston.

Alicia stalled Wednesday, August 17, growing larger and more dangerous offshore. The NWS predicted the storm would move inland between Freeport and Galveston before dawn Thursday. But its erratic and aimless movement throughout the day Wednesday defied accurate prediction.

"It's kind of like a gorilla with a machine gun. It goes where it wants to," said the meteorologist in charge of the weather service for the Houston area.

The slow-moving *Alicia* finally made up its mind and came ashore about 3 a.m. Thursday, August 18, at San Luis Pass with winds of up to 135 mph. It proceeded northward on a path of destruction that left approximately three-quarters of a million HL&P customers without power.

When the fury of *Alicia* had passed, it was painfully obvious that the hurricane had caused the greatest damage to Houston Lighting & Power's electric system in the company's 102-year history.

To repair HL&P's mangled system, the company assembled the largest electric service restoration work force ever in this country.

Following is the account of how Houston Lighting & Power Company responded to Hurricane *Alicia*.

PREPARATION

PREPARATIONS BEGAN MONDAY

HL&P began Monday, August 15, to prepare for *Alicia*. The company activated its Emergency Operation Plan, the blueprint for restoration developed over many years of experience in coping with hurricanes, ice storms and other emergency situations.

The plan designates procedures for departments before, during and after storms. Personnel involved in recovering from *Alicia* knew in advance where to report and what his or her duties were. Supplies of all types were earmarked in advance for storm use and delivered to specified locations in anticipation of use. Field repair vehicles and other equipment were moved to specified locations.

The plan detailed operations down to the last vehicle. Vitally needed trucks received maintenance so they would not be out of service because of a bad tire or an ignition system not working. A gasoline truck was moved to Galveston anticipating pumps might be shut down or local fuel supplies might become contaminated.

Negotiating with contractors would take up precious time during an emergency. So as the plan directed, all pricing and other arrangements had been pre-negotiated with contractors.

In response to a call from the Governor's office, early communication included informing the Governor's disaster task force and the Public Utility Commission of Texas of the company's extensive advance preparations.

POWER PLANTS READIED

The company's generating facilities were one of the first areas that received attention while *Alicia* was just a listless tropical storm.

Preliminary hurricane preparations began at all power plants at the first storm alert on Monday. This consisted of determining what equipment needed to be tied down, checking stocks of supplies for operating the generating units, and determining what food and bedding would be required for personnel to remain at the plants for an extended period of time.

When the formal storm alert was received Wednesday, August 17, final preparations were made following a checklist from each plant's emergency plan.

At this time, employees were notified of work schedules and food and bedding ordered. Employees were told to be prepared to come early to prevent any shortage of trained personnel, and to be prepared to stay as long as necessary.

Exact work schedules varied from plant to plant, depending on the location of each, and were established by closely monitoring ocean tides. For example, at the P.H. Robinson plant, which can be isolated by a five-foot tide in Galveston Bay, storm workers reported at 12:30 p.m. Wednesday. At the Cedar Bayou plant, which would not be isolated until tides reached 10 feet on Trinity Bay, additional employees were brought in late Wednesday evening.

The planning paid off because during Hurricane *Alicia* it was impossible to get people into the Robinson, Deepwater or Cedar Bayou plants for approximately eight hours.

Physical preparation involved tying down everything in the plants that could be blown into switch yards or lines. Glass was taped or boarded up very much as it was in homes and other business facilities. And ropes were run through all walkways so the operators and maintenance people could hang on when walking through the open plant areas during the storm.

At the Sam Bertron and Deepwater plants, which are right on the Houston Ship Channel, hurricane protection dikes constructed years ago provide permanent storm protection. During *Alicia* they prevented extensive flooding of these facilities.

CRITICAL CUSTOMERS CALLED

Looking after the welfare of critical customers--persons who depend on life-sustaining machines--was another area that the company began acting on as *Alicia* approached the service area.

On Wednesday, August 17, Field Activities and Customer Service personnel called each of the 263 persons on the company's critical customer list to verify their situation and the number of hours each person could go without a life-sustaining machine.

By 8 Wednesday night, Field Activities had ascertained that one-third of the persons on the list had made arrangements either to go out of town, enter a hospital or use their own generators. Most of those who had not made arrangements could not afford the alternatives.

Field Activities also checked on the availability of generators. Rental firms were contacted since company-owned generators were going to be needed immediately after the storm to provide emergency power for HL&P facilities.

EMERGENCY EVALUATION CENTER ESTABLISHED

Preparations to activate the company's Emergency Evaluation Center were begun well before Hurricane *Alicia's* arrival. Each year by the start of the hurricane season, the 13th floor conference room in the company's downtown Houston headquarters building is equipped with system wall maps, an eight-channel radio, one regular telephone and six pick-up telephones. One pick-up telephone line goes to the system dispatcher, one to the Transmission Construction office and one to each of HL&P's four zone headquarters. This is done as part of the company's overall Emergency Operation Plan.

The center, operated by the System Engineering Department, provides a centralized point for gathering and disseminating information on system operation and field restoration activities.

Late Wednesday, System Engineering took final steps to activate the Emergency Evaluation Center by gathering copies of smaller service area maps, essential telephone numbers, engineering personnel rosters and other supplies needed for a 24-hour operation.

ENERGY CONTROL CENTER READIED

The nerve center of HL&P's electric system is the Energy Control Center (ECC), located near downtown Houston. The ECC utilizes computer systems operated by highly-trained dispatchers to route the flow of power throughout the company's network of electric lines.

Some ECC personnel were sent home early Wednesday, August 17, so they all could return to the center late that night. Nonperishable goods were brought in to be prepared by employees who served as unofficial chefs.

Communication links between the ECC and the Emergency Evaluation Center were also finalized. Employees then pitched cots where they could find a quiet place and tried to get what little sleep they would be able to before the storm hit.

CUSTOMER SERVICE PREPARED FOR CALLS

The Customer Service Department, known as the "Care Force," prepared for Hurricane *Alicia* by first beefing up staffing of the critical Telephone Service group on Wednesday, August 17.

All Telephone Service Representatives in Houston were advised to be prepared to spend the night. To ensure they would be able to get to the Electric Tower during and immediately after the storm, arrangements were made for rooms in two downtown hotels, rather than risk the possibility of personnel being stranded at home by the hurricane.

GALVESTON, BRAZOSPORT GOT EARLY JUMP

As Hurricane *Alicia* continued on its course toward the Texas coast, it was obvious the southeast portion of the company's service area would be hit first and hardest by the storm.

Consequently, it was decided crews in Galveston and Brazosport would ride out the storm at their respective service centers so they would be able to get an early jump on restoring service to their areas.

On Wednesday, specialized crews including tree trimmers, substation maintenance and underground personnel reported to the Galveston Service Center. Crews stayed on duty into the night, restoring service that was being knocked out by the leading winds of *Alicia*. They finally had to stop at 1:30 a.m. Thursday when hurricane-force winds made it impossible to continue. Workers spent the remainder of the night sleeping in the service center and district office as *Alicia* passed over the island.

At the Brazosport Service Center in Clute, field personnel were allowed to go home early to take care of any personal business so they could return at 11 that night and ride out the storm.

RESTORATION

ENERGY CONTROL CENTER

There may have been no one who saw the storm's destructive power more graphically than dispatchers at HL&P's Energy Control Center (ECC). As *Alicia's* winds felled power lines, knocked out major distribution substations and damaged power plants, ECC dispatchers tracked each event on large electronic maps and computer displays.

They were also responsible for supplying the power generation needs of the 5,000-square-mile area under very adverse circumstances--needs which plunged unbelievably from a high of over 8 million kilowatts at noon Wednesday to almost a 20-year low of 1.3 million kilowatts at noon Thursday. Dispatchers knew that the incredible drop during the storm would be followed by a strong demand for power as field crews started repairing lines.

For this reason, there was particular concern that shutting generating stations back to a low level of output would endanger the system's ability to return quickly to a higher level. Dispatchers, working through the Electric Reliability Council of Texas (ERCOT), made arrangements with other utilities in Texas to export power from the HL&P area during the period of lowest electrical demand--exactly the reverse of most emergency situations when power needs to be imported to a troubled area.

That strategy paid off as demand did rebound strongly. By noon Friday, demand had climbed to over 6 million kilowatts. Customers never knew that throughout the day on Thursday HL&P dispatchers walked a narrow tightrope, balancing electricity supply and demand in a way to avoid supply complications.

Dispatchers' ability to restore high voltage power to substations was speeded through innovative use of an electric system modeling computer. HL&P engineers had originally developed the system to depict the area's electric supply system so that the electrical effects of adding new customers in specific locations could be predicted. With major transmission lines knocked out of service, engineers and dispatchers used the modeling computer to test alternate power delivery routes along remaining lines. In this way, the potential problem of overloading circuits was avoided.

SYSTEM DAMAGE

As the reports came in, it became apparent that *Alicia* had caused enormous damage to HL&P's transmission and distribution system that moves electricity from the power plants to customers.

Fifty transmission circuits were unusable, and 70 HL&P and customer-owned substations were out of service. Of the 1,100 distribution circuits which carry electricity from the substations, 569 were locked out. *Alicia* knocked 6,928 spans of wire and 2,358 poles to the ground. Complicating repair problems was the fact that more than 40,000 service drops, attachments between distribution poles and customer buildings, were torn loose. Finally, 6,213 line fuses had been blown and 2,710 transformers were destroyed by the storm. Three towers, which carry high voltage wires that transmit electricity from power plants to substations, were toppled. The four transmission lines to Galveston were out, leaving the entire island in darkness.

EMERGENCY CREWS MOBILIZED

HL&P assembled probably the largest restoration force ever mobilized to repair an electric system. The company put 1,697 employees qualified for line work into the field. Street lighting and meter reader personnel were pressed into service to re-fuse distribution lines and repair drop lines. Locally contracted crews, consisting of 353 qualified workers, reported for duty on August 19.

An additional 709 people skilled in electrical repair work were brought in from investor-owned and municipal electric utilities across Texas. The first foreign crews arrived August 20. Utilities that sent crews included Central Power and Light, Texas Power & Light, Texas Electric Service, Dallas Power & Light, the Lower Colorado River Authority, the City of Austin and City Public Service of San Antonio.

Fallen trees and broken limbs had to be removed before equipment could be repaired or replaced. HL&P used 250 tree trimming crews, including 85 crews borrowed from municipalities and other Texas electric utilities, to carry out this priority work. Prior to the hurricane's arrival, 10 crews were sent to Galveston because it was feared that *Alicia* might cut off access to the island for some time. The crews were to work from sunrise to just after sunset until *Alicia's* harvest of trees and limbs was removed.

These crews did more than two months' work in just two weeks of 14-hour days, seven days a week.

SYSTEM SURVEYED

As soon as it was safe to do so, supervisory personnel began surveying damage to the entire system. They estimated the extent of the damage and the time crews would need to repair or replace equipment. Air patrols were sent to survey the damage to transmission lines servicing Galveston and other heavily damaged areas.

TRANSMISSION NETWORK RETURNED TO SERVICE

It was necessary to restore the high voltage transmission system between power plants and substations before the distribution system, which begins at the substation, could be restored. By Thursday night, half the 50 transmission circuits reported out were restored. Temporary structures were designed and built to replace the 270-foot Houston Ship Channel crossing tower at the Deepwater plant and the 240-foot crossing tower at Carpenters Bayou.

PRIORITY CUSTOMERS RESTORED QUICKLY

Hospitals, water wells and sewage treatment plants were put back in service first. Then such municipal necessities as police and fire stations were restored to service.

After that HL&P concentrated on restoring major transmission circuits. As these circuits were energized, crews began the difficult task of repairing the distribution system from the substations to customers' homes and businesses. The approach was to commit resources to those locations where the most customers could be restored as quickly as possible.

In the interest of safety and efficiency, most work was carried out during the daylight hours. HL&P normally keeps crews available for emergency nighttime situations. During the restoration period, these crews, specially equipped with lights and generators, worked from 4 p.m. until 6 a.m.

EMERGENCY EVALUATION CENTER

During the critical days of service restoration the Emergency Evaluation Center, operated by System Engineering, provided a centralized point for gathering and disseminating information related to system operation and field restoration activities. The center was in operation around the clock from August 18 until August 22.

System Engineering personnel performed engineering studies to determine temporary reconnection of transmission facilities and issued operating procedures and relay settings so that Transmission & Distribution could accomplish the needed repair work on the most timely basis. The studies considered the best way, not necessarily the easiest way, to make repairs so that additional problems would not be created elsewhere on the system.

One of the most important aspects of the Evaluation Center was determining on which date customers could expect power to be restored. This was a critical element in meeting the needs of the public.

Maps were posted showing each T&D foreman's best estimate of the time necessary to restore service in his assigned area. A copy of this map was supplied to Customer Service and the date entered into a computer so that each telephone representative could bring the information up on his or her screen. Updates were made on a daily basis.

Information collected by the center was relayed to District Operations, the Public Affairs Department, company officers and managers and outside utilities. Information collected on an hourly basis included: the number of distribution circuits off; the number of transmission circuits off; the number of substations off; the system load; the generation on line; the net interchange between HL&P and its neighboring utilities, the generation reserves available and the estimated number of customers without service.

From this center, plans were implemented immediately for procurement of additional help from other utilities to be utilized during the restoration efforts. Information was passed on to District Operations as it developed on the need for housing and food for outside personnel, and when and where they would be arriving at HL&P's service area.

THE ARMY SYSTEM

HL&P's Distribution Department work force is organized into units called armies. Headed by a foreman, each army has the personnel and equipment needed to carry out almost any task it may face. The equipment includes a derrick digger truck to set poles, an insulated double bucket truck and a single bucket truck. If a job does not require all of this equipment, the army can be split up to handle several jobs.

DIFFICULTIES INVOLVED IN RESTORING SERVICE

In recovering from *Alicia's* severe damage, crews were faced with repair assignments that varied from the routine to extremely challenging. A pole or a transformer set beside a street could be replaced without too much difficulty within an hour or so. However, *Alicia* also knocked down poles and lines in backyards and many other difficult locations, including in a bayou with houses and debris blocking access. In the places inaccessible to trucks and power tools, men set poles 50 to 75 feet long by hand and lifted transformers weighing more than a ton by block and tackle.

Most service drops could be repaired within 30 minutes. If there was extensive damage and trees had to be trimmed, restoration took as long as two hours.

Regrettably, one lineman lost his life during the restoration effort. Twenty-five-year-old Harvey A. Lewis was electrocuted August 26 when he came in contact with a 240-volt drop line. Another lineman was seriously burned in a separate incident.

WATER SYSTEMS

One of the most critical problems encountered in the early hours of August 18, after *Alicia* blew through, was restoration of water system services throughout the area. The problem was most urgent in Houston where nearly all of the 126 electrical connections to water services were either down or inoperative.

HL&P crews moved out in the midst of high winds and heavy rains to make emergency repairs to power lines serving the three principal downtown water reservoirs and pumping stations.

The primary effort was directed at restoring power to the Central Water Control Center in downtown Houston because it controls the flow of water in mains throughout the city. The center is served by two different substations, but one, the Crockett substation, sustained such severe storm damage that work was concentrated on getting lines up from the other supply point, the close-in Downtown substation, which had few problems.

HL&P crews successfully energized this crucial water facility about 10:30 a.m. in the midst of driving wind and rain. Priority work was also assigned to the Heights and Staples pumping stations in the near downtown area, and those facilities were back in service by late that same afternoon.

In the meantime, water pressure in the downtown area fell to less than 7 pounds, from a normal pressure of 60 to 65 pounds.

The underground water storage supply at the Central station was depleted in approximately five hours, and the above ground reservoirs at the Heights and Staples stations were emptied by nightfall. All three reservoirs are supplied by deep water wells and work was rushed to connect as many wells as possible to supply additional water to the reservoirs.

At the same time, the South End pumping station serving the Houston Medical Center was out of service, along with most of its supplying wells.

The city of Houston moved rapidly to provide the company with a priority list of well locations and pumps that could provide maximum water delivery. By early Friday morning, the first day following the storm, enough wells were energized to provide a minimum water supply to downtown Houston.

Friday turned out to be bright and sunny. Water pressure in the downtown area continued to be erratic during the day, reaching a high of 30 pounds.

Many large buildings with water tanks located on the ground floor or below ground level were affected by the lack of water pressure. Others with surge tanks above ground level, such as the Electric Tower, could operate only minimally by using auxilary pumps, because the pressure in the mains was not sufficient to lift the water to the holding tanks.

Work continued throughout the weekend to complete restoration of service to water wells supplying the downtown area.

Alicia also wreaked havoc with transmission lines serving the city's east end Clinton Road filtration plant near the Houston Ship Channel, which supplies approximately one-half of Houston's water. By noon Thursday, only hours following the storm, one of the two transmission lines serving this major water facility was restored.

This enabled the plant to supply badly needed water to the downtown area as well as eastern portions of the city. However, high winds, flying limbs, and trees had also knocked out electric service to water pumps at Lake Houston which supplies the filtration plant through an open canal. As a result, the existing water supply in the Clinton plant reservoir was exhausted in a matter of hours.

Three miles of distribution circuits had to be restored through heavily wooded areas before the lake water pumps could be operated. This was done on an emergency basis by Friday afternoon, but due to internal mechanical problems not related to the storm, the Clinton plant was not able to fully utilize the water then available.

Later that day it was determined that the flow of water from Lake Houston had been cut off. Siphons going under the roads, bridges and culverts along the route of the canal had become clogged with trees, limbs, building materials of all types, and other hurricane debris. The siphons at numerous locations along the canal were cleaned out by city crews by noon Saturday, so that Houston's water system began to function normally by noon on Sunday, following the Thursday storm.

MUNICIPAL SERVICES

Restoration of service to police and fire departments, waste water treatment plants, health clinics, nursing homes, and airports was also a priority throughout the area. Most of these facilities have emergency generation, and service was restored as quickly as possible. City officials helped solve many of the traffic problems by simply putting up temporary stop signs.

Hobby Airport in Houston was out of service from early on the first day of the hurricane until about 4 p.m. that same afternoon. Water wells and sewage facilities were restored to the airport on the following day. The airport control tower, which is served separately from the airport terminal, was back in service by Thursday evening but lost service again that night. It was not restored to full operation until Friday afternoon.

HL&P felt it was essential for the leadership of the city to be available to deal with the many problems that were requiring decisive action. As City Hall was not functional because of insufficient water pressure, the company restored service to the homes of several council members to ensure they could stay in communication with their constituents and appropriate city departments.

CUSTOMER SERVICE

As widespread interruption of customers' electric service occurred, a plan was implemented designed to maximize the company's ability to answer calls and issue appropriate field orders. It included suspending many routine functions, temporarily reassigning Customer Service personnel and enlisting aid from those in other departments.

All Customer Service employees worked 12- to 14-hour shifts at normal or temporary work locations since Telephone Service, which always operates 24 hours a day, 7 days a week, suddenly had to handle a much heavier volume of calls around the clock.

Their work was severly hampered when city water pressure to the building fell so low the morning of August 18 that the air conditioning system in the Electric Tower could not operate and vital equipment could not be cooled. Thus, the Telephone Service phone system and the computer system for issuing field orders had to be shut down for 18 hours. During this period, customer calls had to be answered through the main switchboard and handwritten orders had to be manually carried to dispatching locations.

Temperatures in the building rose above 90 degrees for two days. To provide partial air conditioning for Customer Service and cooling to essential systems in the building, six 18-wheel tank trucks shuttled back and forth to haul a total of 350,000 gallons of water to fill the building's surge tank.

Some 56 hours after the air conditioning system was shut down, the system was again operating at full capacity.

The 414 Telephone Service Division employees, with assistance from over 450 additional personnel, answered 510,400 customer calls in the 11 days from Thursday, August 18, through Sunday, August 28. On Saturday, August 20, over 66,400 calls were handled. (During a "normal" busy weekday less than 20,000 calls are made by customers, and weekends average less than 3,000 calls per day.)

Furnishing accurate estimates when electric service would be restored was difficult at first. The Mapping and the Engineering Divisions worked together to develop a method of arranging information gathered by field personnel according to customer Geographic Location Numbers (GLN's), determining estimated restoration dates and providing them to all personnel answering customer calls. This listing was updated daily.

Telephone personnel also responded to special needs to customers such as making calls to those who requested a "wake-up service."

To help take some of the load off Customer Service, other employees were pressed into service to phone customers. Such was the case at the EDC, Baybrook and South Houston Complex where employees working there made calls to confirm total power restoration, partial restoration, or no service after individual circuits had been energized. They also answered customers' questions and relayed information upon request from a Service Center to the customer. Call-back operators worked from Customer Service Orders, sorted usually by circuit and fuse, recording information obtained from the customer in response to the call-back operator's questions. Service Centers supported by this activity included Berry, South Houston, Brazoria, Bayshore and Magnolia Park.

Customer Service Department management faced the challenge of maintaining morale, as employees faced long hours, exhaustion, heat, unpleasant conditions and furious customers. To help relieve the pressure of the job, employees were provided flowers, cookies, and even popcorn from a commercial popcorn machine that was brought into the building. The service representative who took the 450,000th customer call was awarded a dinner for two, and an original storm song, written and recorded by several employees, was played for everyone. A large, prominently-displayed poster conveyed messages of encouragement and appreciation from company executives. Some of them also sat down with the representatives and handled customer calls. Encouragement from customers in the form of compliments and thank you notes was displayed on another wall.

As company-owned generators became available, they were delivered to critical customers who were without power. While company generators were tied up in the restoration effort, critical customers were provided generators obtained from rental firms.

A problem faced by many critical customers with generators was the unavailability of gasoline. Field Activities personnel came to the rescue by locating service stations with operating pumps, obtaining gasoline and delivering it to critical customers. This service was provided through Saturday, August 20.

Some 35 to 40 special requests from critical customers were handled during and after the storm.

One example of the special efforts taken to aid critical customers involved a young boy who was on a respirator. He was due home from the hospital, but his family did not have a generator. There were none available in the HL&P system. A Field Activities representative located one at a rental agency, but the family did not have the $150 cash deposit. The rental agency agreed to take the employee's personal credit card providing the company would be responsible.

On the Sunday following *Alicia*, a man who lived in the NASA area called and said his generator had gone out and he needed help. A company-owned generator was rushed to his home. He used it for three days before going into a hospital. He later called to express his thanks for HL&P's help and for the fact that it had saved him three day's worth of hospital bills.

As the result of Hurricane *Alicia*, HL&P has received about 50 applications from persons wanting to be listed as critical customers. Each request is being checked out through a home visit by a Field Activities representative. Anyone found eligible will be added to the critical customer list.

PUBLIC INFORMATION

Maintaining the flow of information to customers, federal, state and city officials was a major responsibility. The company provided daily updates of restoration progress to the Public Utility Commission of Texas and the mayor of Houston. Company officials also contacted the Department of Energy's Office of Energy Emergency Operations in Washington the day after *Alicia* struck to apprise them of the status of HL&P's system. Public Affairs personnel worked round the clock making sure that critical information was made available to news media as it came in to the company's Emergency Evaluation Center.

Public Affairs' storm preparation is renewed at the start of hurricane season each year by updating large wall maps in the media center and by installing storm phones with direct lines to service centers. Communications to news media were distributed by Western Union TWX as well as by telephone and direct delivery. Special storm telephone numbers were also given to news media outlets at the onset of the storm. As a result, communication was never a problem.

Besides providing damage and repair updates throughout the days and nights before and after the storm, Public Affairs worked to make sure that particularly important messages got priority. All news media, particularly radio stations, gave excellent cooperation in relaying current information out to customers.

For example, a serious safety concern for linemen and customers from portable generators was publicized. If these machines are wired directly into a home's electric system, current can flow back through the HL&P wires, with transformers boosting the voltage to dangerous levels. Effective communication was needed to warn customers of this hazard.

Public Affairs personnel also assisted news media representatives in providing information on downed wires. Passengers who found themselves in cars with lines down on them were advised on how to leave the vehicle safely.

Customers trimming trees were advised to stay clear of power lines. In recently restored areas, customers were reminded not to drop trimmed limbs on power lines lest the service be lost again. One newspaper declined to name an individual who accidentally caused his subdivision to lose power in this way due to fear for his personal safety if his neighbors found out.

News media interviews were also arranged with work crews and company officials. Rumors were quelled and questions were answered. Frauds were reported. For example, as tree trimming crews worked through a neighborhood, a man went ahead of the crews seeking to collect a fee for their services. With news media help, customers were quickly advised that the company was seeking no fees and that the police should be notified if someone sought to collect for HL&P's tree trimming work.

Over 500 calls were received from news media outlets seeking information, some from as far away as England, and a large number of calls was initiated to local news media. Thirty-nine storm damage and restoration progress reports were distributed by the department during storm repair efforts.

PURCHASING OF NEW EQUIPMENT

With so much equipment to repair or replace, equipment purchases were a critical element in the recovery from *Alicia*. HL&P placed 1,323 emergency orders for equipment, supplies and services by the end of August.

In anticipation of *Alicia*, HL&P began to purchase equipment and supplies two days before the hurricane's arrival. Storm related purchasing would continue for 12 days after the storm. Seventeen purchasing personnel were sent to the South Houston Stores facility where they issued purchase orders. Many vendors assigned their people to the South Houston facility to work directly with HL&P personnel in locating and obtaining equipment.

Some equipment was difficult to locate, particularly of designs which where no longer in regular production but which were needed to mate with older, installed equipment. HL&P buyers located and air freighted small lots of those special items from every possible source during storm restoration.

Alicia's extensive damage meant that ingenuity replaced standard operating procedure whenever necessary. With so many poles damaged or destroyed, pole suppliers were instructed to fill emergency requests by substituting generic stock similar to the company's normal specifications. When HL&P could not obtain cross arms that met normal specifications, the company substituted cross arms which were longer or drilled differently.

Several manufacturers dedicated their supplies solely to HL&P. By September 2, HL&P had ordered approximately 3,000 distribution poles, and almost 4,000 wooden cross arms and approximately 4,500 pole-type distribution transformers were ordered as storm replacements.

More than 5.6 million feet of wire had been ordered, along with a total of 26,158 insulators. Many standard meter sockets could not be reinstalled so approximately 7,000 meter sockets were ordered and 3,000 were obtained from two other Texas utilities.

Large amounts of miscellaneous equipment were purchased to supply the large number of crews involved in storm recovery. For example, over 5,000 flashlights and 80,000 flashlight batteries were bought along with portable generators, lights, hand and power tools.

RESTORATION BY SERVICE CENTER

Bayshore Service Center

Forty-two of the 43 distribution circuits in the Clear Lake area were locked out, and transmission lines to one substation were dead following *Alicia's* high winds and heavy rains. Initial restoration efforts were hampered by flooding, which isolated the Bayshore Service Center until 1 p.m. on August 18. Most of the area's 40,500 customers were without power at that time.

Bayshore's engineers, augmented by others from service centers within the Northern Zone, immediately set about surveying major damage on all circuits. Their goal was to restore power to hospitals, water and sewer services, police and fire departments and civil defense.

The normal Bayshore construction force of three armies (about 86 linemen and helpers), 3 two-man cut-in crews, plus a night emergency crew and two troublemen led the restoration program. They were aided initially by five crews (19 linemen) from an independent electrical contractor. Midway through the effort, another electrical contractor sent three crews into the area, and on Sunday, August 28, three armies from Bellaire Service Center and three armies from H.O. Clarke Service Center arrived to complete the restoration.

On August 29, a Bayshore army was sent to Galveston while all other Bayshore personnel stayed in the district to complete minor hookups.

Baytown Service Center

Located along Trinity Bay and on the "dirty" northeast side of Hurricane *Alicia's* path, the Baytown District suffered severe wind damage that left an estimated 95 percent of the district's 44,000 customers without electric service. All but four of the 41 distribution circuits feeding out of seven substations that supply power to the Baytown, Channelview and Crosby areas were inoperative following the hurricane.

Flooding was confined to Baytown's Brownwood subdivision, but damage there was severe. All of the subdivision's 300 homes sustained 50 to 100 percent destruction.

The Baytown Service Center attacked the problem with all the forces it could muster. The number of qualified line workers was more than tripled from a normal level of 50 by the addition of 73 linemen from Texas Electric Service Company and about 30 from Texas Power & Light. In addition, engineering personnel walked the circuits ahead of line crews to locate and identify damage.

All Baytown Service Center employees worked 14 hours a day through August 28, when virtually all customers had service restored. For most this represented 14 consecutive days on the job.

Bellaire Service Center

Most of the 130,000 customers served out of Bellaire Service Center were without lights on the morning of August 18. A large proportion of the damage in the Bellaire Service Center area was the result of falling limbs and trees in the densely-wooded parts of River Oaks, West University Place and the City of Bellaire.

During the process of restoration, employees from all areas on the Bellaire work force were assigned to ride with crews, i.e., clerk typists, receptionists, power consultants, field service advisors and others. These people discussed power restoration problems with customers while allowing line crew members to get on with the job at hand.

Line crew personnel consisted of five armies normally located at Bellaire, assisted by crews from throughout the Western Zone, including Katy, Sealy, Fort Bend and H.O. Clarke service centers. Five contract crews were also employed in the effort.

Most of the electrical outages were cleared by Friday, September 2, with total restoration made on Labor Day, September 5.

Brazoria Service Center

Six of the 14 substations serving HL&P customers in northern Brazoria County lost all electrical input, and all but two distribution circuits out of 29 were locked out during the peak of the storm. That left at least 95 percent of the 23,000 Brazoria District customers without power. In addition, all of the Galveston District's 4,000 mainland customers adjacent to the Brazoria District were out of power at the height of the storm.

As soon as the high winds of the storm subsided, HL&P crews were mobilized and began restoration work. The Brazoria construction force consisted of six line crews, eight 2-man cut-in crews, two daytime trouble men plus a night emergency crew of two trouble men (approximately 61 linemen helpers and meter men.) In addition to these people, the restoration was accomplished by three local contract crews, a total of 17 men: three crews of 22 men from Central Power and Light Company; and five tree trimming crews.

All major circuits in the Brazoria District were restored by Monday, August 22. Brazoria Transmission & Distribution crews and three local electrical contract crews continued repairs on laterals and refusing line fuses, while the three Central Power and Light crews assigned to Brazoria were transferred to Galveston Island.

On Monday, August 22, the Brazoria District had restored service to about 95 percent of its customers. It was then that four of Brazoria's T&D crews were sent to Galveston Island to aid in its restoration. The remaining crews replaced transformers, broken poles and repaired service drops to isolated customers through Friday, September 2.

Brazosport Service Center

The Brazosport area on the Gulf Coast was one of the first to be struck by *Alicia* as it roared across the coastline about 3 a.m. Thursday, August 18. The heavily wooded cities of Lake Jackson, Clute, Richwood and Jones Creek had the most damage, and customers in those areas were out of service for the longest period of time. Electric service in Freeport, the largest city in the area, was restored fairly rapidly due to the lack of trees in that muncipality.

Only two of the 27 feeder circuits out of Brazosport's five substations remained operative by 8 a.m. on the day of the hurricane. Fifteen miles of line along the beach, from Surfside to San Luis Pass, were destroyed and had to be completely rebuilt.

Restoration began at 8:30 a.m. August 18, using all available personnel at the center, which is normally served by four Transmission and Distribution field crews of about 40 men and 18 substation servicemen. Central Power and Light Company sent 132 men to help during early restoration on August 20 and 21. They were then transferred to the Galveston District, but 48 of the total returned August 26 and stayed through the 28th to continue work.

Ten crews from Trees Incorporated cleared the area of trees so linemen could work. Line damage from trees would have been much more severe had it not been for the fact that tree trimmers had worked most of the areas in the spring of this year.

A total of 14 days were required to completely restore power, with 98 percent of all customers back in service in nine days.

Fort Bend Service Center

Hurricane *Alicia* interrupted service to approximately 26,000 Fort Bend District customers, representing about two-thirds of the area's 38,500 total. Two transmission circuits and 22 of the 29 distribution circuits serving the area were locked out at the height of the storm.

The southern and eastern portions of the Fort Bend service area, including parts of Harris and Brazoria counties, were the hardest hit. Two command centers were established in accordance with the company's Emergency Operation Plan. One operated out of the Fort Bend Service Center in Rosenberg, and the other was located at the Needville substation.

Restoration was accomplished without the assistance of outside crews and was completed on Sunday, August 21. Fort Bend personnel were then reassigned to the Bellaire, H.O. Clarke, South Houston, Spring Branch, and Galveston service centers for the balance of the restoration period.

Galveston Service Center

All four transmission line circuits to Galveston were knocked out of service by 5:30 on the morning of the storm, cutting off all power to the island.

The first transmission line was placed back in service to Galveston about 2:30 a.m. on August 19. By 3:30 a.m. service had been restored to three of the four Galveston substations, two hospitals, the city hall, the main fire station, two water plants, and a portion of the downtown area.

By nightfall of the 19th, service was restored to about 10 percent of Galveston Island customers east of the airport. Work was concentrated on major city water and sewage plants, critical customers, grocery stores, service stations, Civil Defense, Red Cross and major feeder circuits.

During the restortation period, personnel strength ranged from 350 to 600 workers daily -- including crews from the Lower Colorado River Authority, and many HL&P employees from various areas of the company including Customer Relations, Transmission Department, Garage, Engineering, and Safety.

Employees worked a minimum of 14-hour days, restoring service from 7 a.m. until 9 p.m. -- with some crews doing night restoration work. The main office and dispatcher's office were staffed 24 hours a day. Virtually all service was restored by September 2 to customers whose homes were not severly damaged.

The Galveston District replaced approximately 616 poles, 1,610 spans of primary, 904 line fuses, 573 transformers, 1,227 spans of secondary, 685 transformer fuses, 11 pole top switches, and 3,013 service drops, while taking 20,000 trouble calls through the switchboard.

Greenspoint Service Center

Greenspoint Service Center serves a heavily wooded area in north Houston and Harris County and was hit hard by falling trees and flying debris from Hurricane *Alicia*.

At the height of the hurricane, 55 circuits were locked out, 50 poles were down, and 1,000 transformers out of service.

Restoration was aided by outside crews from Austin, who worked in the area of Aldine-Westfield Road. Greenspoint crews handled the rest of the effort themselves, to the point that they were soon able to send six crews to help in the Humble area.

A 138,000-volt line between the T.H. Wharton and Little York substations was also knocked out. Progress in getting this important transmission line back in service was hampered for several days as limbs weakened by the high winds continued to fall long after the storm had passed.

Most customers in the district were back on line within a week of the storm.

H.O. Clarke Service Center

About 80 percent of the 100,000 customers served out of the H.O. Clarke Service Center in south and southwest Houston lost power on August 18. Seventy of the 90 circuits serving the area were knocked out by *Alicia's* winds. However, on the first day of restoration all but six circuits were placed back in operation.

The heaviest concentration of damage was in an area bounded by South MacGregor, Mykawa Road, Sims Bayou and the new Highway 288 freeway. During one three-day period at the height of the restoration effort, 33 crews were working in this four-square-mile area.

Armies from Katy, Fort Bend and Sugarland service centers were employed at various times during the restoration process. Three contract crews were used continuously, along with one rehabilitation army and 30 tree trimming crews.

At the peak of restoration, about 485 people were working in the H.O. Clarke Clarke service area.

Most service center personnel returned to an eight-hour work day on approximately September 1. Field personnel also reduced their work day to a 10-hour day on about the same date.

Humble Service Center

The Humble area was particularly hard hit due to the large amount of trees in the northeast quadrant of HL&P's service area.

Heavy rain hampered tree trimmers. In some instances, they were led by meter readers and engineers to areas where they had to wade in or even swim, holding chain saws over one shoulder. In the Kingwood subdivision northeast of Humble, linemen were waist-deep in water.

The 11 Humble Service Center line crews were aided by six additional crews from Greenspoint Service Center, plus 230 men from area electrical contractor organizations and 93 tree trimmers.

Over 18,000 calls were received in the service center, which was open to walk-in traffic all through the storm to answer customers' concerns. Status reports were also made available on a 24-hour basis to customers who called in requesting the information.

Customer Representatives kept in close contact with all critical customers. One man in particular, an amputee with a heart condition who had to use a breathing machine, refused to leave his mobile home. A portable generator was placed at his home until crews restored service to the home late that day.

Katy/Sealy Service Centers

In the 300-square-mile Katy/Sealy District, 80 to 90 percent of HL&P's 27,000 customers experienced power outages, with the peak occurring about 7 a.m. August 18. However, because the area was on the western fringe of the storm, line damage was not extensive and 70 percent of the customers in the district had power restored by the evening of Saturday, August 20.

The next day Katy/Sealy was able to send two of its three line crew armies to help with restoration work in the Bellaire District. Monday, it was able to release its remaining crew to Bellaire. Until September 1, virtually all 50 Katy/Sealy T&D personnel assisted in repair operations out of the Bellaire, Hiram Clarke and Berry service centers.

Customer Service Representatives worked shifts to cover telephones from 7 a.m. to 9 p.m. through Friday, August 26, when almost all trouble in the district had been taken care of. After handling the immediate situation, most Katy Service Center personnel were reassigned to help at other offices.

Magnolia Park/Berry Service Centers

One hundred and seventy-six square miles in the near north and east portions of the city of Houston, encompassing 218,000 customers, are served by the Magnolia Park and Berry service centers. Substantial damage occurred in these close-in areas, which also constitute a great deal of the older sections of town.

Falling trees were a major obstacle in restoration of electric service throughout the area.

Oak Forest subdivision on the near northwest side of Houston was hit hard again, as it was in the May tornadoes. It is an older area with many large trees.

During the course of the storm restoration, four motor generators were supplied to customers to power lung and heart machines when the customers were too sick to be moved to a hospital.

Complete line repair was accomplished in the Magnolia Park Service Center area of operations on the Houston east side by September 2. Final restoration of service in the Berry Service Center area on the near northwest (Oak Forest subdivision), and near northeast (Scenic Woods subdivision) portions of Houston was completed September 5.

South Houston/Pasadena Service Centers

In the early morning hours of August 18, about 90 percent of the Pasadena District's 120,000 customers were without electric service. The South Houston Service Center also lost power and operated on generators for most of the first day of the storm. The Pasadena District serves a 400-square-mile area, encompassing the cities of South Houston, Deer Park, Pasadena and parts of Houston.

An early assessment showed that 90 of 102 distribution circuits in the district were locked out. By Friday, 44 of the 102 circuits were still out.

Other damage also was extensive: 1,200 spans of primary and secondary wire were down along with 229 poles, 87 transformers, and 2,532 house drops. Five hundred line fuses were also out and 175 transformer fuses were blown.

South Houston/Pasadena's normal construction force consists of 90 linemen and helpers. However, during the restoration, they were aided by six crews (30 men) from Bellaire and Rosenberg; 12 crews from two area electrical contractors; 10 men from Texas Power & Light; fifteen 2-man and five 1-man crews from Substation and Shops; and 28 tree trimmers.

Sewage facilities in the South Houston/Pasadena area were not operable Friday morning due to low water pressure, and line crews attacked this problem first. They also reconnected city water wells, hospitals, police and fire stations, civil defense offices and customers on HL&P's "Critical Customer" list. Much of this early restoration work was done in heavy street flooding.

By Friday night, all municipal services had enough power to sustain themselves, and by Saturday they were fully energized.

About 75 percent of the customers in the district had their power back on Saturday. By August 29, 95 percent of all customers were back on line. Restoration became increasingly difficult because the remaining customers had trees that needed to be trimmed or house drops that had to be repaired before service could be restored. All customers had their service restored by September 1.

Spring Branch Service Center

Most of the 125,000 customers in the populous Spring Branch District in the western part of Houston live in densely-wooded older neighborhoods served by an extensive network of overhead electrical distribution lines. This combination resulted in extensive line damage and power outages that lasted well over a week, even with help from crews sent by neighboring utilities and other HL&P service centers.

The area includes numerous critical facilities including three hospitals as well as water pumping, fire and police stations in independent communities such as Hunters Creek, Hedwig Village, Piney Point, Bunker Hill and Spring Valley Village.

Virtually all of the more than 170 employees who work at Spring Branch Service Center put in 14 to 16-hour days. For T&D crews, this schedule continued from Thursday, August 18, until Monday, August 29, with no days off. The district received help from 63 workers from San Antonio and Austin early the week of August 22, and later crews from Tomball and Greenspoint service centers moved into the area to assist.

Spring Branch also devised a system of screening and then field checking customer reports of outages that appeared to be due to simple fuse problems. Night crews, who were unable to do extensive climbing and complex repairs, went to locations on the "fuse list". They had a 97 percent success rate restoring service by simply tripping line fuses at these locations because of careful advance screening.

As the outage time lengthened, growing numbers of customers called to claim a critical need for priority restoration. A power consultant screened these calls and dispatched personnel to visit many of these customers in order to determine whether he or she had a bonafide critical need, what restoration work was required, and what other steps might be taken if service could not be restored in a short period of time.

By Sunday, August 28, service to all customers had been restored and crews turned their attention to "trouble" calls --customers who reported voltage problems, flickering lights and partial service.

Sugar Land Service Center

The 146-square-mile area southwest of Houston served by the Sugar Land Service Center was not greatly affected by the storm. The area is sparsely wooded and most homes and businesses in the area are serviced through underground lines. The most heavily damaged area was bounded by Westheimer, Gessner, Buffalo Bayou, and West Belt, where there is a high concentration of trees.

After high winds subsided, critical customers were contacted to check if they had lost service. Calls were also placed to utility districts to check their status.

By late Thursday afternoon, District Operations personnel were teaming with T&D and Engineering to survey circuits and get service back in operation. Restoration was completed on August 21, and area personnel were either assigned to T&D crews to help other service centers or relocated directly to heavily damaged areas in Channelview and Bayshore.

Tomball Service Center

Approximately 80 percent of the Tomball District's 40,000 customers in northwest Harris County lost power during the height of the storm. Two area substations, Louetta and Rayford, were temporarily knocked out. In addition, 1,046 spans of primary lines were downed, 54 poles broken or uprooted and 135 transformers destroyed.

A 138,000-volt tie line between the Tomball and Rayford substations was also knocked out. Many customers in the district live in rural areas, and they were affected the most and for the longest period of time by the outages.

Crews were able to restore power to most customers in three to five days, with the entire restoration effort handled by personnel from the Tomball Service Center. Outside crews were not needed.

The Tomball Service Center's restoration efforts netted them a personal letter of thanks from the mayor of Tomball on behalf of the entire city.

Wharton Service Center

The area served by the company's Wharton Service Center in Wharton County encountered the least amount of damage of any part of the company's service area.

Only about 600 electrical outages were caused by the storm with most of them confined to the eastern half of the district. The longest any one customer was without service was approximately 30 hours.

A large number of Wharton District employees were reassigned to Houston and Galveston restoration work beginning Friday, August 19.

POWER PLANT DAMAGE

Hurricane *Alicia* caused an estimated $5 million in damage to HL&P power plants. The largest single item of that total was $1.3 million damage to supplemental cooling towers at the P.H. Robinson plant on Galveston Bay, the hardest hit of the company's nine generating stations.

The Robinson plant also sustained major damage to four of its five auxiliary cooling towers. In addition, roofs were blown off both control rooms, the service building and the machine shop. The boiler feed pump on Unit 1 had to be rebuilt and motors had to be rewound on two circulating water pumps and one boiler feed pump.

The capacity of both units at Robinson was reduced from 450,000 kilowatts to 425,000 for 12 days following the storm. While both units were brought back into service, Unit 1 was later shut down again for storm-related repairs.

At the Webster plant on Clear Lake, all transmission lines out of the plant went out, causing Unit 3, the only one in operation at the time, to trip off. This caused a complete plant shutdown. When power was lost, lubrication to the unit also was lost so the hydrogen seals had to be replaced. The loss of power also caused an oil fire in the unit.

At the W.A. Parish plant south of Richmond-Rosenberg, the Unit 7 cooling tower was damaged and an induced draft fan motor on Unit 5 was knocked out of service. Because damage to Unit 5 limited its capacity to 225 megawatts, compared to a normal capacity of 670 megawatts, it was shut down for repairs and annual maintenance.

At the Deepwater plant a 138,000-volt transmission line tower next to the Ship Channel collapsed. The static line broke on the number 3 generator transformer towers at the Sam Bertron plant on the Ship Channel. In addition, sheet metal and insulation were blown off fuel oil storage tanks there. The cooling pond dike at the Cedar Bayou plant on Trinity Bay was washed out and required extensive repair work. A cooling tower at the Hiram Clarke plant in the southern part of Houston was damaged, and the roof of the control room at the T.H. Wharton plant near Tomball blew off.

In addition, sheet metal blew off cable trays and boiler casings at nearly every plant, and all sustained a great many types of less serious damage.

HL&P BUILDING DAMAGE

High winds and torrential rains caused approximately a half million dollars in damage to company office buildings, repair shops, warehouses and other facilities. Damage was spread throughout the system, at 19 different service centers, the Energy Control Center in downtown Houston, the Energy Development Complex off the Gulf Freeway, and the South Houston Complex in Pasadena.

Architecture Department personnel worked out of their homes on the first day of the storm, calling company locations for damage reports, contacting contractors and prioritizing work to start at the various locations on the next day. Buildings with severe water penetrations and extensive glass damage were given top priority.

As work progressed, members of the department toured the system with contractor representatives to point out problems and coordinate the repair.

Hardest hit were the Energy Development Complex with a total estimated damage of $235,000, and the Transmission & Distribution Shops building at the South Houston Complex, where water damage was estimated at $74,900.

Roofs were ripped off many buildings, along with ventilators, vent stacks, and hatches of various kinds. Water problems included those at the Galveston District office where torrential rain actually bled through the brick walls.

Glass, identification sign, ceiling and wall damage was common at most locations. A massive 25-foot-high glass panel was broken and several smaller ones at the Energy Control Center in downtown Houston were cracked by flying debris.

TREASURY RESPONSE

Counting out the money was a prime duty for personnel in the Treasury Department in the days following Hurricane *Alicia*. Cash transactions were the order of the day as Treasury supplied funds to service centers.

Treasury made telephone arrangements with banks to expand the funds. The banks, who were asked to honor checks, went a step further and carried the account until they could be reimbursed.

To meet the demand for large amounts of cash, major Houston banks provided money as it was needed. The company borrowed in excess of $200,000 and was allowed to draw over the amount of funds in an account. Calls to a bank provided funds in 20 to 30 minutes.

Normally, small amounts to cover incidentals are kept in manager funds at banks throughout HL&P's service area. However, these funds were not sufficient to meet the needs of restoration work. Also, cash was needed to pay for crews' meals and lodging at smaller restaurants and hotels that do not offer credit, as well as for other essentials.

Service centers also needed cash to buy ice, sodas, coffee, doughnuts and meals for workers in the field. Some 300 to 400 men might be working in a service center area and more than a nominal amount of cash was required to meet the needs of the workers.

Although most service centers would send a representative to the Electric Tower to pick up cash, one member of Treasury responded to an emergency on the Sunday following *Alicia*. A call that he received at home prompted him to personally deliver cash to three service centers.

Another example of the cooperation the company received from banks involved Dallas Power & Light payroll checks. DP&L crews who arrived in Houston with newly-issued paychecks faced the dilemma of where to cash them.

A call on Saturday to Texas Commerce Bancshares provided arrangements for one of their banks so that the DP&L workers could get checks cashed without difficulty.

One service center did not require extra cash due to a unique situation. In Galveston, arrangements were made with the Holiday Inn to provide all meals and lodging for restoration workers. The hotel management did not ask for any cash in advance, but provided services on credit.

On the day of the hurricane, the company had $15 million in funds that matured. Merrill-Lynch and the banks that normally handle reinvestment of funds were closed. Telephone arrangements were made with Goldman, Sachs & Co. of Dallas to reinvest the money on HL&P's word until the following Monday when script could actually change hands.

It wasn't only financial institutions that went the extra mile, but Treasury employees as well. The 36-member clerical-cashier force processed bills Friday in 90-degree temperature. The cashier section processed the most electric bill stubs ever in one day -- more than 107,000. The previous high had been more than 93,000 compared with the 60,000 to 65,000 normally handled in one day. And three cash tellers handled some $250,000 in cash for service centers without a single error.

CORPORATE ACCOUNTING

Hurricane *Alicia* placed additional demands on HL&P's accounting personnel. Before *Alicia* struck, a system was established to collect storm costs, and charge account information was relayed throughout HL&P.

Accounting personnel processed over 400,000 hours of overtime payroll. There was a 50 percent increase in the usual number of checks processed to cover employee related work expenses. The acquisition of needed replacement equipment resulted in a multi-fold increase in processing these purchases.

Because the computer was shut down from a lack of air conditioning, accounting personnel worked the weekend to get billing systems back on schedule on Monday, August 22. Since customer payments were not processed when the computers were out of service, delinquency notices and collector's bills were suspended to allow time for all payments to be processed.

CUSTOMER RESPONSE

The 750,000 customers without power represented almost two million people--by far the most that had ever been without service in HL&P's area. Yet for the most part customers were understanding and patient, realizing the massive damage the storm had caused. The rain had hardly cleared Thursday when a few customer thank-you calls started coming in to Customer Service. And though most of the phone calls for the next few days were outage reports and complaints, a lot of appreciative calls and letters were received.

Customers who were without electricity for several days, although few in number compared with the total, were understandably angry. It was especially difficult to try to explain why their lights were off when their neighbor's were on. To them, it seemed efficient to send a crew to restore their service, and priorities based on need or numbers that did not include them were of little comfort.

CONCLUSION

Alicia represents the latest and greatest of many challenges HL&P has overcome in more than 100 years of providing reliable electric service to the Houston-Gulf Coast.

Until *Alicia*, Hurricane *Carla*, which struck the service area in 1961, had been the yardstick by which HL&P had measured tropical storms. But that is no longer the case.

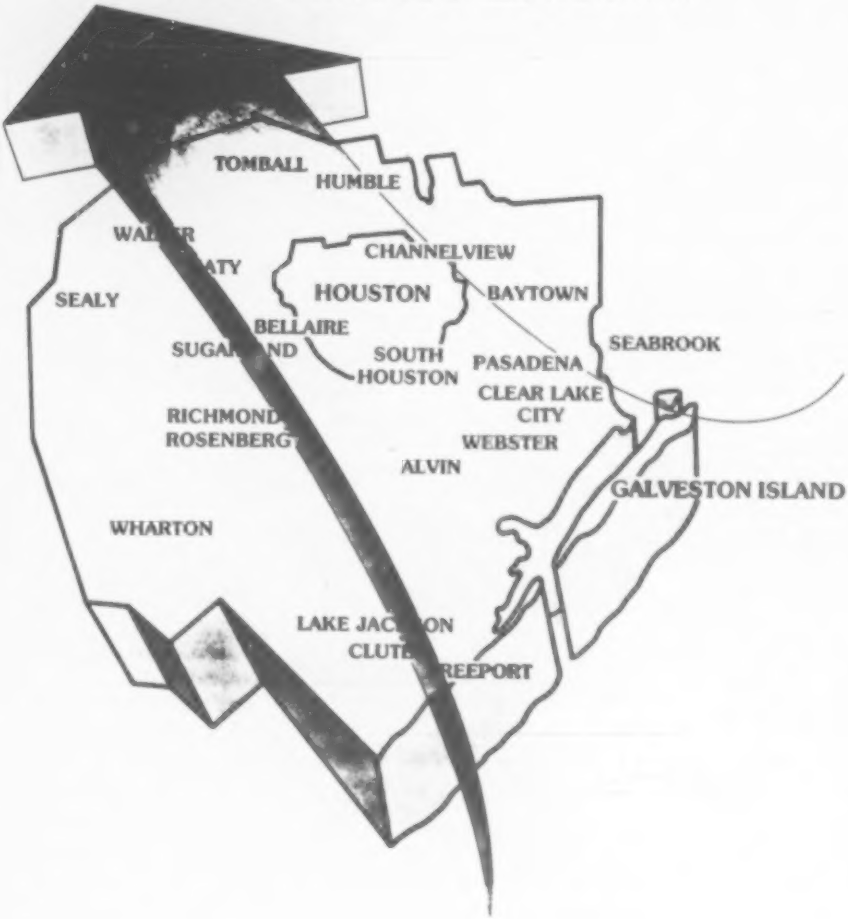
More customers lost their electric service as a result of Hurricane *Alicia* than HL&P had customers in 1961. *Alicia* knocked out more than five times as many circuits and broke or uprooted twice as many poles as did *Carla*. Approximately 8,000 miles of electric lines were put out of commission by *Alicia*. Six hundred miles of line -- the distance between Houston and Birmingham -- were knocked down.

Through October 31, the cost to HL&P from Hurricane *Alicia* totalled $27 million.

Probably no other electric system in the country has incurred more damage than did HL&P's as a result of *Alicia*.

Through the untiring efforts of the men and women of Houston Lighting & Power Company, a restoration effort unparalled in this country's history was accomplished in 16 days.

PATH OF ALICIA THROUGH SERVICE AREA



ALICIA CHRONOLOGY OF EVENTS

Monday, August 15

- *Alicia* forms in the north-central Gulf of Mexico, about 350 miles east of Corpus Christi.
- HL&P personnel activate the Emergency Operation Plan and begin preliminary storm preparations.

Tuesday, August 16

- Tropical Storm *Alicia* turns into a hurricane at 11 p.m., about 140 miles southeast of Galveston.

Wednesday, August 17

- Critical customers called to assess their situations.
- Crews and equipment moved to Galveston and Brazosport to ride out storm.
- Galveston/Freeport area begins experiencing power outages from *Alicia's* leading winds about 4 p.m..

Thursday, August 18

- Hurricane *Alicia* makes landfall at 3 a.m. between Freeport and Galveston Island.
- All transmission lines to Galveston Island knocked out at 5:30 a.m.
- Approximately 750,000 customers without electric service by noon.
- Electric demand plunges to a near 20-year low of 1.3 million kilowatts at noon.
- HL&P's computerized customer information system shut down due to lack of water pressure in downtown Houston at 12:15 p.m..
- Restoration begins in the southern part of the service area.
- *Alicia* moves out of service area at 4 p.m.
- Service restored to some 420,000 customers by end of day.

Friday, August 19

- Additional 130,000 customers' service restored.
- Local contract crews, consisting of 353 workers, begin assisting HL&P crews.

Saturday, August 20

- Service restored to another 25,000 customers.
- Customer Service receives over 66,400 calls.
- First line crews arrive from Central Power and Light.
- All substations back in service except for Stewart substation on Galveston Island.

Sunday, August 21

- Additional 23,000 customers' service restored.
- Customer Service handles more than 49,000 calls.

Monday, August 22

- Service is restored to another 26,000 customers.
- More than 56,000 calls received by Customer Service.
- Crews arrive from City Public Service of San Antonio to supplement restoration work force.

Tuesday, August 23

- Additional 27,000 customers' service restored.
- More out-of-town crews arrive, bringing total field force to approximately 3,900.

Wednesday, August 24

— Electric service to additional 24,000 customers restored.

— Sixty percent of service east of airport on Galveston Island restored.

Thursday, August 25

— Approximately 17,000 customers' service restored.

— About 75 percent of service on Galveston Island restored.

— Severe thunderstorms move through western part of Houston causing further outages.

Friday, August 26

— Additional 13,000 customers' service restored.

— More crews outside utility crews aiding Gulf States Utilities join restoration work force.

— Customer Service takes 450,000th call since *Alicia* struck.

— Last substation (Stewart on Galveston Island) placed back in service.

Saturday, August 27

— Service to another 10,000 customer restored.

— Central Power and Light requests 33 of its 180 people return to the Rio Grande Valley as Tropical Storm *Barry* heads toward South Texas.

Sunday, August 28

— Service restored to additional 15,000 customers.

— More than 80 percent of Galveston Island's service restored.

Monday, August 29

— Service restored to 99 percent of all customers by end of day.

Tuesday, August 30

— Customer Service handles 500,000th call since storm.

Wednesday, August 31

— Service restored to all but about 3,000 customers, with most of them residing on Galveston Island.

Thursday, September 1

— Restoration efforts continue on Galveston Island and heavily-wooded areas in Houston and eastern part of service area.

Friday, September 2

— Service restored to all HL&P customers who are able to take service.

DAMAGE TO TRANSMISSION & DISTRIBUTION FACILITIES AT ALICIA'S HEIGHT

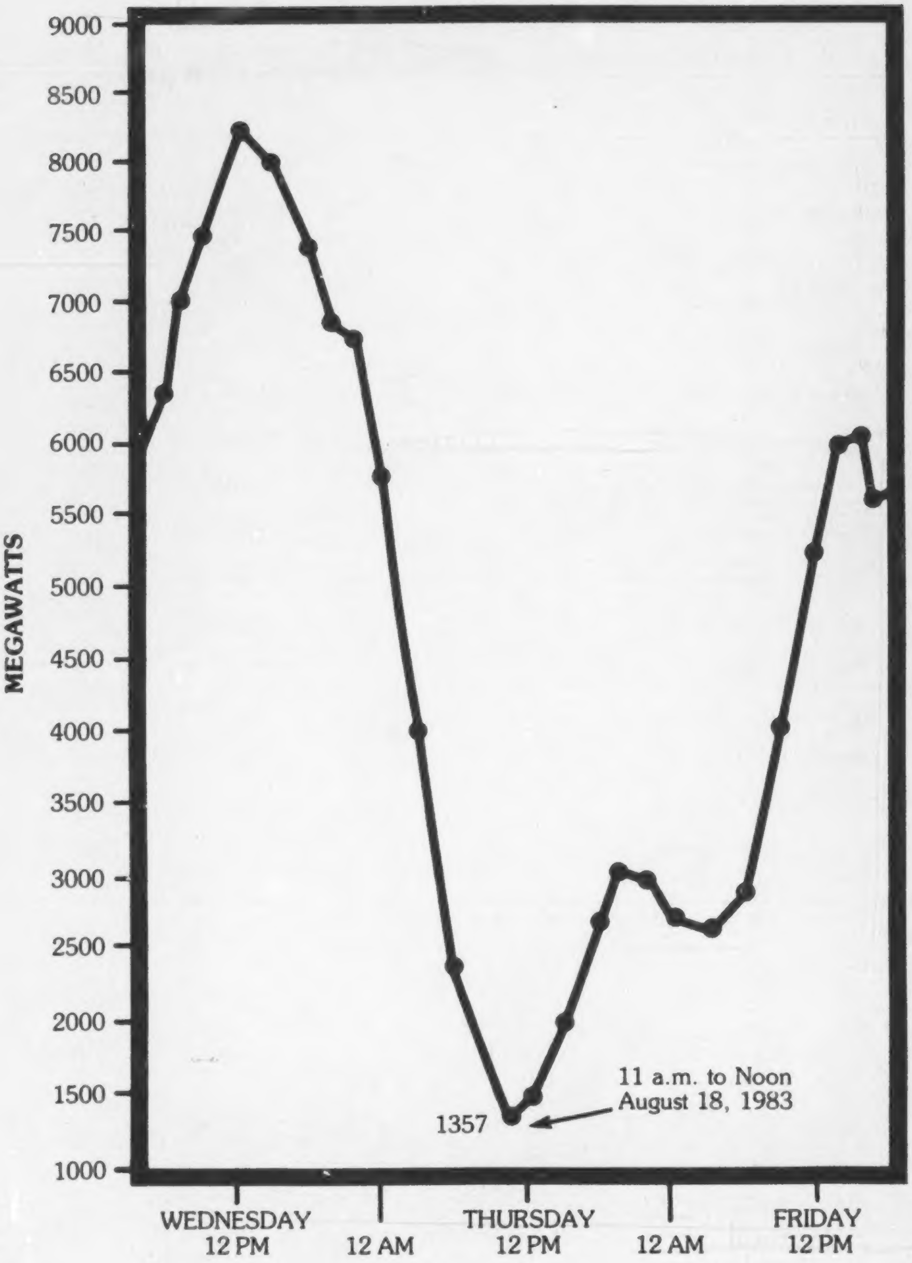
Service Drop Lines Downed (estimate)	40,000
Spans of Primary Wire Downed	6,928
Line Fuses Blown	6,213
Poles Downed	2,358
Transformers Destroyed	2,710
Distribution Circuits Out	569
Transmission Circuits Out	50
Substations Out	70

SERVICE RESTORATION PROGRESS

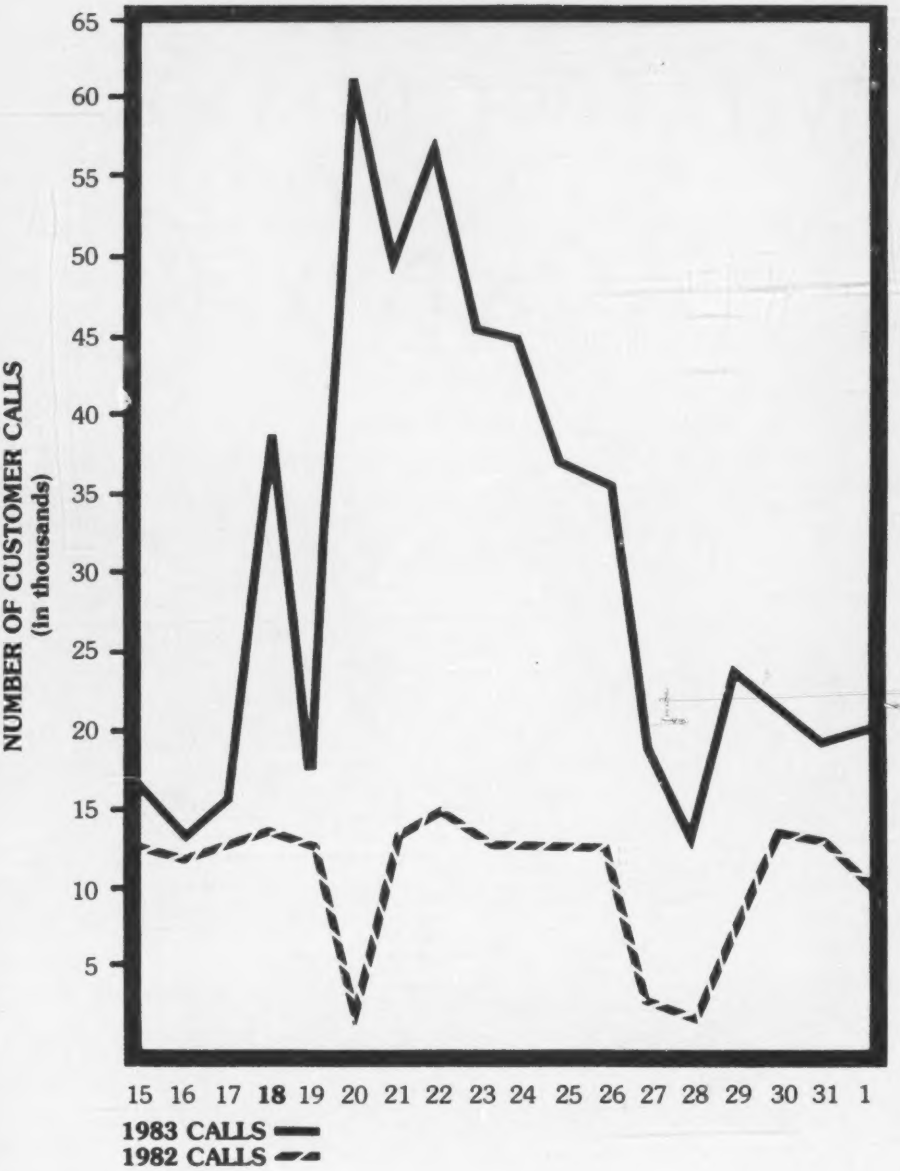
DATE	NUMBER OF CUSTOMERS WITHOUT SERVICE AT END OF EACH DAY
Thursday, August 18 (Noon)	750,000
Thursday, August 18	330,000
Friday, August 19	200,000
Saturday, August 20	175,000
Sunday, August 21	152,000
Monday, August 22	126,000
Tuesday, August 23	99,000
Wednesday, August 24	75,000
Thursday, August 25	58,000
Friday, August 26	45,000
Saturday, August 27	35,000
Sunday, August 28	20,000
Monday, August 29	8,000
Tuesday, August 30	4,000
Wednesday, August 31	3,000
Thursday, September 1	1,000
Monday, September 5	*****

* Service restored to all HL&P customers able to take service.

SYSTEM LOAD


9000
8500
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
MEGAWATTS
1357
11 a.m. to Noon
August 18, 1983
WEDNESDAY
12 PM
12 AM
THURSDAY
12 PM
12 AM
FRIDAY
12 PM

CUSTOMER CALLS TAKEN
(AUGUST 15 - SEPTEMBER 1, 1983)



(Ad appeared in area daily newspapers Aug. 24 and 25)

A MESSAGE TO OUR CUSTOMERS FROM THE LIGHT COMPANY

WHAT WE'RE DOING TO RESTORE YOUR POWER

When Alicia's 135-mile-an-hour winds blew in, the lights blew out—for more than 750,000 of you. It was the worst hurricane ever to hit this area in terms of electrical damage. By midday Thursday nearly three-fourths of our system was not working.

Since then, every available employee has been put on the restoration job. Crews are working round the clock on 14-hour shifts to get the lights back on. And neighbors from around the state have sent their electrical crews to help. They're from Central Power and Light Company, The City of Austin, San Antonio Public Service, Texas Power & Light, Texas Electric Service, and the Lower Colorado River Authority. Fifty-five line crews from local contractors also volunteered to assist. Altogether, it's the largest group of electrical line crews ever assembled for a storm restoration project.

Two hundred and forty tree-trimming crews are also hard at work clearing limbs and debris from power lines so they can be reconnected. In addition to our regular tree trimmers, we have called in others from Dallas, Arlington, San Antonio, Beaumont, Victoria, and Ft. Worth to help get line crews into heavily hit wooded areas.

The 'easy' part was getting the main lines back up so most of our customers could get service. That put 650,000 residents back on line. If you're not one of them, be assured that we're working day and night to restore your power as quickly as possible.

Solving the remainder of the problem.

Now we are into the time-consuming effort of "walking the circuits" to find electrical problems that are keeping homes from getting power back.

Our employees who can't climb poles are out surveying individual areas and subdivisions to give us a personal assessment of the problems, so our line crews don't have to waste time locating trouble spots.

If falling trees or lines have damaged electrical service connections around meters, homeowners may need to have an electrician make repairs before electric service can be reconnected.

A word of caution

In the meantime, please be careful of any downed electric lines that may still be in your yard, street or area and call us about them immediately. Stay clear of downed lines, and warn others to, also. Please do not attempt to remove any lines yourself or try to reconnect your own electric service. Our people are putting their lives on the line every day—because they know what they are doing. There is no need for you to put yours on the line.

If you're replacing an antenna that may have blown down, be particularly careful when putting it up, so that it cannot possibly fall across an electric line. Should you have any doubt about it, please have a professional handle it.

We'll keep working

Work will continue 24 hours a day to speed service to those still without power. We know how important electricity is to you and your family, and the lights will be back on as soon as humanly possible.

Thanks for your patience and understanding.

The Light company

Houston Lighting & Power

(Ad appeared in area daily newspapers Aug. 29 and 30)

A MESSAGE TO THOSE WHOSE LIGHTS ARE STILL OFF

In the aftermath of Alicia, 8,000 miles of electric line were not working; 600 miles of line—the distance between here and Birmingham—were knocked down. A total of 2,358 poles were broken or uprooted, and 6,213 line fuses blown. Over 750,000 HL&P customers were without power. It was the worst electrical disaster ever to hit the United States.

Much of that has already been repaired—and we're working hard to restore power to the rest of you as quickly as possible.

Getting lights to the most people in the least time

Long days in the dark and heat have created difficult living conditions for you, and many businesses are still unable to operate. But you are not forgotten by any means.

Our efforts have been devoted to getting the most customers back on in the shortest possible time. Unfortunately, it often takes just as much time to get one person or one business back on as it does to get power to several blocks of homes and businesses. If the transformer behind your home or business has to be replaced, or the house wires are down between you and the power line in back of your home, that is an individual problem which we will get to as soon as possible.

Our customer service department is now in a position to tell you the date on which you are scheduled to receive service, as a result of personal field surveys. That date, of course, is an approximation based on the latest available information.

No shortages of men or material

There has been no shortage of materials, no shortage of manpower. Our only shortage has been time. The system was built over a period of 102 years, and damage of this extent cannot be rebuilt in two weeks.

Our line construction and service personnel, plus those from throughout Texas—a total of 516 crews in all—are working round the clock on 14-hour overlapping shifts, and have been since the winds subsided enough to get into the field. Our customer service people have been working straight 12-hour shifts, 12 on and 12 off, since the day the storm hit.

The company has ample supplies of materials stockpiled in 19 service centers located throughout the service area, plus a large central warehouse facility. Company buyers have been on the job 14 hours a day expediting materials into this area, and our vendors have cooperated in an extraordinary manner. There is no shortage of poles, wire, clamps, or transformers.

As many crews as possible are working

More crews from other companies within or outside of the state will not speed the work any further. Use of additional crews is limited by our ability to supervise their actions properly: to instruct them in the intricacies of our particular system, and to avoid tragic accidents. Electrical work is extremely hazardous, and safety is of great importance.

Storm plan is working

HL&P has a comprehensive storm plan, developed from the experience of Hurricane Carla and other storms in Texas, plus the experience of other companies on the Gulf Coast and Florida's east coast. Every mile of our 5,000-square-mile service area has been assigned in advance to various line crews. That way they are totally familiar with the area when it becomes necessary to restore power. Individual crews are organized into "armies" in a military-type organization to get the maximum production from experienced employees.

Your service is important to us

While we have more than 700,000 customers back on line, we are still concerned that you are out of service. We know electricity is an absolute necessity. And our entire company is geared exclusively to the full restoration of power. It's our number one priority. We are treating your problem as urgently as we tackled others on the very first day of the storm.

Your reasonable, responsible consideration of all the factors involved in this major disaster is sincerely appreciated.

The Light company

Houston Lighting & Power

RESTORATION FORCE: HL&P PERSONNEL

DISTRIBUTION	SUBSTATION CONSTRUCTION	UNDERGROUND	STREET LIGHTING	METER	RADIO	SHOPS
WESTERN ZONE						
42 Line Crews 34 Service Crews 15 Servicemen (366 People) (14 Dispatchers)	9 Crews (27 People)	17 Crews (60 People)		8 Crews (23 People)	2 Crews (4 People)	3 Crews (6 People)
		TOTAL PERSONNEL: 500				
EASTERN ZONE						
29 Line Crews 21 Service Crews 12 Servicemen (251 People) (17 Dispatchers)	7 Crews (20 People)	6 Crews (28 People)		22 Crews (70 People)	2 Crews (4 People)	
		TOTAL PERSONNEL: 390				
NORTHERN ZONE						
37 Line Crews 27 Service Crews 9 Servicemen (336 People) (16 Dispatchers)		1 Crew (13 People)	14 Crews (60 People)	9 Crews (23 People)	2 Crews (4 People)	
		TOTAL PERSONNEL: 452				
SOUTHERN ZONE						
35 Line Crews 23 Service Crews 17 Servicemen (267 People) (14 Dispatchers)	21 Crews (69 People)	4 Crews (15 People)		10 Crews (23 People)	2 Crews (10 People)	10 Crews (18 People)
		TOTAL PERSONNEL: 416				

TOTAL T&D PERSONNEL: 1,758

OTHER HL&P PERSONNEL: 6,640

HL&P RESTORATION FORCE: 8,398

RESTORATION FORCE: CONTRACT AND OTHER UTILITY CREWS

CONTRACT CREWS		OTHER UTILITY CREWS
	WESTERN ZONE	
Vico - 7 Crews (38 People)		
Foley - 1 Crew (6 People)		
	EASTERN ZONE	
Pfeiffer - 3 Crews (16 People)		TP&L - 30 Line Crews - 35 Service Crews (215 People)
Sargent - 3 Crews (17 People)		TESCO - 10 Line Crews - 15 Service Crews (73 People)
Pepco - 3 Crews (18 People)		DP&L - 12 Line Crews - 14 Service Crews (94 People)
	NORTHERN ZONE	
Dacon - 5 Crews (15 People)		City of Austin -11 Crews (23 People)
North Houston - 15 Crews (126 People)		Public Service of San Antonio - 5 Line Crews - 5 Service Crews (40 People)
	SOUTHERN ZONE	
L. E. Meyers - 17 Crews (97 People)		LCRA - 4 Line Crews (28 People)
Midland - 2 Transmission Crews (20 People)		CP&L - 23 Line Crews - 30 Service Crews - 4 Transmission Crews (180 People)
		TP&L - 4 Transmission Crews (56 People)
353 Contract Personnel		**709 Other Utility Personnel**

TOTAL OUTSIDE PERSONNEL: 1,062